

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

PROBABILITY AND STATISTICS FOR ENGINEERS

(Common to CE and EEE)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL																		
Q.1	i. Define independence of events..	1M	1	1																		
	ii. The function $f(x) = kx^3$ in $0 < x < 1$ is a valid p.d.f. find the value of k .	1M	1	2																		
	iii. Write the moment generating function of Binomial distribution.	1M	2	1																		
	iv. Find the value of Z_1 such that $P[-Z_1 < Z < Z_1] = 0.95$	1M	2	2																		
	v. Define discrete joint density function.	1M	3	1																		
	vi. Explain critical region.	1M	3	1																		
	vii. Explain Level of Significance.	1M	4	1																		
	viii. If $P=0.5$ and the sample size is 250 then the standard error is	1M	4	1																		
	ix. What is one-way ANOVA?	1M	5	1																		
	x. Write the degrees of freedom for error in $m \times m$ LSD.	1M	5	1																		
Q.2(A)	a) State and prove addition theorem for two events. b) Assume that in a nuclear accident 30% of the workers are exposed to LD_{50} and die; 40% of the workers die; and 68% are exposed to LD_{50} or die. What is the probability that a randomly selected worker is exposed to the LD_{50} ? Find the probability that a randomly selected worker is exposed to LD_{50} but does not die.	10M	1	2																		
OR																						
Q.2(B)	Let X denote, the number of holes that for can be drilled per bit. The density for X is given the following table: <table border="1" style="margin: 10px auto; border-collapse: collapse;"><tr><td style="padding: 2px 5px;">x</td><td style="padding: 2px 5px;">1</td><td style="padding: 2px 5px;">2</td><td style="padding: 2px 5px;">3</td><td style="padding: 2px 5px;">4</td><td style="padding: 2px 5px;">5</td><td style="padding: 2px 5px;">6</td><td style="padding: 2px 5px;">7</td><td style="padding: 2px 5px;">8</td></tr><tr><td style="padding: 2px 5px;">$f(x)$</td><td style="padding: 2px 5px;">0.02</td><td style="padding: 2px 5px;">0.03</td><td style="padding: 2px 5px;">0.05</td><td style="padding: 2px 5px;">0.2</td><td style="padding: 2px 5px;">0.4</td><td style="padding: 2px 5px;">0.2</td><td style="padding: 2px 5px;">0.07</td><td style="padding: 2px 5px;">$f(8)$</td></tr></table>	x	1	2	3	4	5	6	7	8	$f(x)$	0.02	0.03	0.05	0.2	0.4	0.2	0.07	$f(8)$	10M	1	3
x	1	2	3	4	5	6	7	8														
$f(x)$	0.02	0.03	0.05	0.2	0.4	0.2	0.07	$f(8)$														
(i) Find $f(8)$																						
(ii) Find the table for F																						
(iii) Use F to find the probability that a randomly selected bit can be used to drill between three and five holes inclusive.																						
(iv) Find $p(X \leq 4)$ and $p(X < 4)$. Are these probabilities the same?																						
Q.3(A)	Derive moment generating function of Normal distribution and then find mean and variance.	10M	2	4																		
OR																						
Q.3(B)	Let X be a Poisson random variable with parameter λ (or k) = 10. Find the (i) $P[X < 4]$ (ii) $P[X \geq 3]$ (iii) $P[1 < X < 5]$ (iv) $E(X)$ and $Var(X)$	10M	2	3																		

Q.4(A) For the following bivariate probability distribution find (i) marginal distributions of X and Y (ii) $V(X)$ and $V(Y)$ (iii) Covariance between X and Y (iv) Conditional densities of X given $Y=2$

$X \backslash Y$	0	1	2	3
0	0.840	0.030	0.020	0.010
1	0.060	0.010	0.008	0.002
2	0.010	0.005	0.004	0.001

OR

Q.4(B) The joint density for (X, Y) is given by 10M 3 4

$$f(x, y) = xye^{-x}e^{-y} \quad x > 0, y > 0$$

- (i) Find the marginal densities for X and Y .
- (ii) $Cov(X, Y)$
- (iii) Are X and Y independent?
- (iv) Find $p(X \leq 1)$

Q.5(A) A random sample of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favor of the proposal. Test the hypothesis that proportions of men and women in favor of the proposal are same, at 5% l.o.s? 10M 4 3

OR

Q.5(B) (i) A random sample of size 81 was taken from the population whose variance is 20.25. Sample mean is 32. Construct 95% confidence interval for the population mean. 10M 4 3

(ii) Find 95% confidence limits for the mean of a normally distributed population from which the following sample was taken 15, 17, 10, 18, 16, 9, 7, 11, 13, 14.

Q.6(A) Five breeds of cattle B_1, B_2, B_3, B_4, B_5 are fed on four different rations R_1, R_2, R_3, R_4 . Gains in weights in kg over a given period were recorded and given below: 10M 5 5

	B_1	B_2	B_3	B_4	B_5
R_1	1.9	2.2	2.6	1.8	2.1
R_2	2.5	1.9	2.3	2.6	2.2
R_3	1.7	1.9	2.2	2.0	2.1
R_4	2.1	1.8	2.5	2.3	2.4

Find if there is a significant difference between (i) breeds and (ii) rations.

OR

Q.6(B) The following layout presents the observations made on 5 treatments A, B, C, D, E in an experiment of paddy crop by adopting LSD. The figures indicate the grain yield of paddy in kg/plot. Analyze the data and draw your conclusion. 10M 5 5

B-5	D-6	E-3	A-10	C-12
C-9	A-4	B-6	E-5	D-5
D-8	C-15	A-7	B-6	E-5
E-5	B-8	C-13	D-9	A-5
A-9	E-6	D-12	C-16	B-18

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Question Paper Code: 20CE104

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

ENVIRONMENTAL ENGINEERING
(Civil Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL												
Q.1	i. Define "per capita water demand"	1M	1	1												
	ii. Define Detention Period?	1M	1	1												
	iii. What is BOD and COD	1M	2	1												
	iv. Define sewage and sewerage?	1M	2	1												
	v. What is the purpose of sludge digestion?	1M	3	2												
	vi. What is Sludge Thickening?	1M	3	2												
	vii. Define Air quality Index?	1M	4	1												
	viii. What is the unit used to express the noise?	1M	4	2												
	ix. What is a hazardous waste?	1M	5	2												
	x. What is vermifiltration?	1M	5	2												
Q.2(A)	The population of 5 decades from 1930 to 1970 are given in table. find out the population after one, two and three decades beyond the last one decade, by using Incremental increase method.	10M	1	3												
	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Year</td> <td>1930</td> <td>1940</td> <td>1950</td> <td>1960</td> <td>1970</td> </tr> <tr> <td>Population</td> <td>28,000</td> <td>40,000</td> <td>45,000</td> <td>52,000</td> <td>58,000</td> </tr> </table>	Year	1930	1940	1950	1960	1970	Population	28,000	40,000	45,000	52,000	58,000			
Year	1930	1940	1950	1960	1970											
Population	28,000	40,000	45,000	52,000	58,000											
	OR															
Q.2(B)	Explain chlorination process in water treatment with graphical representation?	10M	1	2												
Q.3(A)	Explain the working principle of Trickling filter with neat diagram?	10M	2	2												
	OR															
Q.3(B)	Explain the four stages of wastewater treatment with diagram.	10M	2	3												
Q.4(A)	Explain the stages of sludge digestion and explain the Biogas recovery process?	10M	3	2												
	OR															
Q.4(B)	Explain the working principle of the Oxidation Ditch with neat sketch?	10M	3	3												
Q.5(A)	What is noise pollution? Explain the different methods used to control noi	10M	4	3												
	OR															
Q.5(B)	Explain various types of air pollution and their effects on Environment	10M	4	2												
Q.6(A)	Explain the steps involved in municipal solid waste (MSW) management?	10M	5	3												
	OR															
Q.6(B)	What is biodegradable solid waste? Explain the methods of waste management using reduce, reuse and recycle principles?	10M	5	2												

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

ENGINEERING HYDROLOGY

(Civil Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What is convective precipitation?	1M	1	1
	ii. What is anticyclone?	1M	1	1
	iii. What is Potential Evapotranspiration?	1M	2	1
	iv. What is Pigmy meter?	1M	3	1
	v. What is specific capacity of well?	1M	5	1
	vi. What is the shape of the water table line when water flows from one lake to another through the soil?	1M	5	1
	vii. Distinguish between channel and reservoir routing?	1M	4	1
	viii. What is Flow duration curve?	1M	4	1
	ix. What is Pan Coefficient?	1M	2	1
	x. What is the use of Lysimeter?	1M	2	1
Q.2(A)	Discuss about different forms of precipitation. How do you estimate missing rainfall data? Explain in detail.	10M	1	1
OR				
Q.2(B)	Explain various methods of finding average rainfall over a catchment area.	10M	1	2
Q.3(A)	In a 140-min storm the following rates of rainfall were observed in successive 20-min intervals: 6.0, 6.0, 18.0, 13.0, 2.0, 2.0 and 12.0 mm/h. Assuming ϕ -index value as 3.0 mm/h and an initial loss of 0.8 mm. determine the total rainfall, net runoff and W-index of the storm.	10M	2	5
OR				
Q.3(B)	(i) Explain briefly the evaporation process. Discuss the factors that affect the evaporation from water body.	5M	2	2
	(iii) What are the various methods of reducing evaporation loss from water body?	5M		
Q.4(A)	(i) With the help of suitable diagram, explain the method of finding river discharge using <i>area velocity method</i> .	5M	3	2
		5M		
	(ii) What is a rating curve? Explain methods of finding stage at zero discharge			
OR				
Q.4(B)	(i) Define Unit Hydrograph and Discuss the assumptions for the Unit Hydrograph theory	5M	3	2
	(iii) Discuss the methods of separating baseflow from runoff hydrograph	5M		
Q.5(A)	A 160 ha watershed has the following characteristics: Maximum length of travel of water in the catchment=4000m, Difference in elevation between the most remote point on the catchment and the outlet=85m, Land use:	10M	4	5

Land use/land cover	Area (ha)	Runoff coefficient
Forest	50	0.21
Pasture	20	0.16
Cultivated Land	90	0.43

The maximum intensity-duration-frequency relationship for the watershed is given by

$$i = \frac{2.97T^{0.159}}{(D + 0.18)^{0.815}}$$

Where, i = intensity in cm/h, T = Return period in years and D = duration of rainfall in hours.

Estimate 30 year peak runoff from the watershed that can be expected.

OR

c in per cent	50	68	80	90	95	99
$f(c)$	0.674	1.00	1.282	1.645	1.96	2.58

- Q.5(B) Data covering a period of 92 years for the river Ganga at Raiwala yielded the mean and standard derivation of the annual flood series as 6241 and 2986 m³ /s respectively. Using Gumbel's method estimate the flood discharge with a return period of 1000 years. 10M 4 5
 What are the (a) 95% and (b) 80% confidence limits for this estimate?
 for $N = 92$ years, $y_n = 0.5589$ and $S_n = 1.2020$

- Q.6(A) (i) Using suitable diagram derive the expression to estimate discharge from a unconfined aquifer of width B . 5M 5 5

(i) A 30-cm well completely penetrates *an unconfined aquifer*. After a long period of pumping at a steady rate of 1500 lpm, the height of water table from the bottom in two observation wells 25 and 75 m from the pumping well were found to be 36.5 and 38.0 m respectively. Determine the permeability of the aquifer. 5M

OR

- Q.6(B) (i) Two lakes A (surface elevation 24.2m) and B (surface elevation 19.2m), 1800m away are separated by a land mass (permeability 40m/day) lying on an impervious horizontal later (elevation 16m). Determine the flow between the lakes assuming no infiltration loss. 6M 5 5

(ii) Draw and describe the Artesian Well. What is Aquiclude? 4M

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Hall Ticket No:

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Question Paper Code: 20CE106

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

CONCRETE TECHNOLOGY

(Civil Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What are the primary chemical components of Portland cement?	1M	1	1
	ii. How does the hydration process contribute to the strength development of cement?	1M	1	2
	iii. How workability of concrete is measured using different tests?	1M	2	1
	iv. What are the key steps involved in the manufacture of concrete?	1M	2	1
	v. Differentiate between modulus of elasticity and dynamic modulus of elasticity in concrete.	1M	3	1
	vi. Define Poisson's ratio in the context of concrete elasticity.	1M	3	1
	vii. How are statistical methods utilized in concrete mix design and quality control processes?	1M	4	2
	viii. What are the typical acceptance criteria used for evaluating concrete quality?	1M	4	1
	ix. Define high-performance concrete (HPC) and discuss its key properties.	1M	5	1
	x. Explain the concept of self-consolidating concrete (SCC) and its advantages in construction.	1M	5	1
Q.2(A)	Discuss in detail the chemical composition of Portland cement, including the role of each component in its properties and performance?	10M	1	2
OR				
Q.2(B)	Explain the process of hydration in Portland cement. How does it influence the strength and durability of concrete?	10M	1	2
Q.3(A)	Explain the setting times of concrete and the factors that influence them. How does temperature affect the setting time, and what measures can be taken to control it during construction?	10M	2	2
OR				
Q.3(B)	Outline the steps involved in the manufacture of concrete, from batching of materials to transportation and placement on the construction site. What are the critical considerations at each stage to ensure the quality and performance of the final product?	10M	2	2
Q.4(A)	Define Poisson's ratio in the context of concrete elasticity. Discuss its calculation, significance, and implications for material behavior under stress and strain. How does Poisson's ratio affect the overall performance and stability of concrete structures?	10M	3	2
OR				
Q.4(B)	Discuss the various types of shrinkage in concrete, including plastic shrinkage, autogenous shrinkage, drying shrinkage, and carbonation shrinkage. How do these types of shrinkage occur, and what are their effects on dimensional stability, cracking susceptibility, and long-term durability of concrete structures?	10M	3	2

Q.5(A) Discuss in detail the factors that engineers consider when choosing mix proportions for concrete. How do factors such as desired strength, workability, durability, and environmental conditions influence mix design decisions? 10M 4 2

OR

Q.5(B) Design a M20 grade concrete mix with the following data: 10M 4 4

- Maximum nominal size of aggregate = 40 mm.
- Minimum cement content = 330 Kg/m³
- Maximum W/C ratio = 0.55
- Slump = 150 mm
- Exposure condition = Severe
- Type of aggregate = Crushed angular aggregate
- Specific gravity of cement = 3.00
- Specific gravity of coarse aggregate = 2.60
- Specific gravity of fine aggregate = 2.40
- Water absorption of coarse aggregate = 0.60 %
- Water absorption of fine aggregate = 1.00 %
- Maximum cement content = 430 Kg/m³

You can use admixtures if needed, adopt ranges based on IS codes.

Q.6(A) Explore the wide range of applications for fiber-reinforced concrete (FRC) in civil engineering and construction. Provide examples of structural and non-structural applications where FRC is used to improve performance, enhance durability, and reduce maintenance requirements. 10M 5 2

OR

Q.6(B) Define high-performance concrete (HPC) and discuss its properties, including high strength, high durability, and enhanced workability. How is HPC produced, and what are its advantages over conventional concrete in terms of performance and longevity? 10M 5 2

***** END*****

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(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

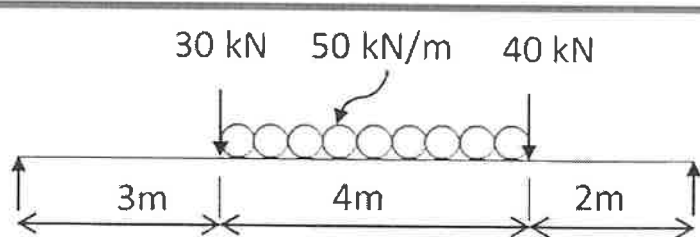
STRENGTH OF MATERIALS

(Civil Engineering)

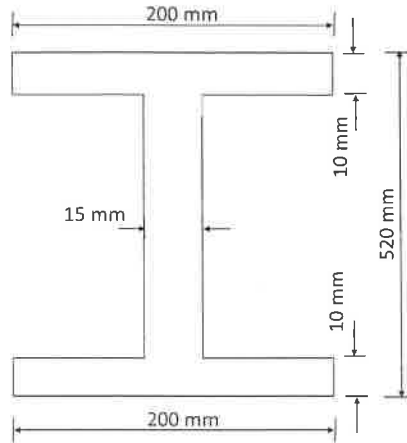
Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What is Composite bar?	1M	1	1
	ii. Draw the stress-strain plot for mild steel.	1M	1	1
	iii. Mention the different types of beams and supports?	1M	2	2
	iv. Write the formula to obtain the Rankine's critical load of the column.	1M	2	1
	v. Write the equation for simple bending theory	1M	3	1
	vi. Draw the shear stress distribution for rectangular section?	1M	3	4
	vii. Write the formula for torque transmitted by a solid shaft.	1M	4	1
	viii. Give two methods to compute principal stresses?	1M	4	2
	ix. Write the slope and deflection formulae for a SSB subjected to point load at mid span.	1M	5	1
	x. Write the relation between bending moment, slope and deflection.	1M	5	1
Q.2(A)	A steel rod of 5 cm diameter and 4 m long is connected to two grips and the rod is maintained at a temperature of 100°C. Determine the stress and pull exerted when the temperature fall to 30°C, if (i) the ends do not yield and (ii) the ends yield by 0.12 cm. Take $E=2 \times 10^5 \text{ N/mm}^2$ and $\alpha=12 \times 10^{-6}/^\circ\text{C}$.	10M	1	4
OR				
Q.2(B)	A metallic bar 250 mm x 100 mm x 40 mm is subjected to a force of 50 kN (Tensile, along 100 mm x 40 mm face), 60 kN (tensile, along 250 mm x 40mm face) and 40 kN (tensile, along 250 mm x 100 mm face) along x, y and z directions respectively. Determine the change in volume of the block. Take $E=2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio = 0.20.	10M	1	4
Q.3(A)		10M	2	4
Draw SFD and BMD for the beam shown in Figure and also find location and magnitude of maximum bending moment.				
OR				
Q.3(B)	(i) Draw SFD and BMD for a cantilever beam subjected to UDL over the entire span. (ii) Draw SFD and BMD for a Simply supported beam subjected to Point load at center.	10M	2	4
Q.4(A)	A simply supported beam of span 4m has a uniform square cross section 230 mm x 230 mm. if the permissible stress in the material is limited to 50 N/mm ² , determine the following (i) Maximum UDL it can carry, (ii) Maximum concentrated load at a point 2m from the support it can carry, and (iii) Maximum central point load it can carry	4M 3M 3M	3	4
OR				

- Q.4(B) The SSB of span 4 m has a cross section as shown in Figure. If the permissible stress of the material of beam is 140 N/mm^2 . To determine (i) the maximum UDL it can carry, (ii) the maximum point load it can carry at the center of span, and (iii) the maximum point load if can carry at a distance of 1 m from left support. 10M 3 4



- Q.5(A) A hollow shaft, having an internal diameter 40 % of its external diameter, transmits 562.5 kW power at 200 rpm. Determine the external diameter of the shaft if shear stress is not to exceed 60 N/mm^2 and the angle of twist in a length of 2.5 m should not exceed 1.3 degrees. Assume maximum torque = 1.25 mean torque and modulus of rigidity = $9 \times 10^4 \text{ N/mm}^2$. 10M 4 4

OR

- Q.5(B) A rectangular block of material is subjected to a tensile stress of 110 N/mm^2 on one plane and a tensile stress of 47 N/mm^2 on the plane right angles to the former. Each of the above stresses is accompanied by a shear stress of 63 N/mm^2 . To find the (i) direction and magnitude of Principal stress and (ii) magnitude of greatest shear stress. 10M 4 4

- Q.6(A) Derive the expression for maximum slope and maximum deflection of a cantilever beam subjected to eccentric point load using moment area method. 10M 5 3

OR

- Q.6(B) Using Moment Area method find
 (i) slope and deflection of a cantilever beam subjected to UDL over the entire span and 5M 5 4
 (ii) slope and deflection of SSB subjected to point load at center. 5M

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations – May 2024

INDUCTION AND SYNCHRONOUS MACHINES

(EEE)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What is hemitropic winding?	1M	1	1
	ii. Differentiate balanced and unbalanced windings.	1M	1	1
	iii. When the load on an alternator varies then its terminal voltage is also found to be varied. Why ?	1M	2	1
	iv. What is meant by the term regulation of an alternator?	1M	2	1
	v. Define torque angle.	1M	3	1
	vi. What is meant by V curves?	1M	3	1
	vii. What are the main advantages of a cage motor?	1M	4	1
	viii. Define slip.	1M	4	1
	ix. What are the various losses in an induction motor? On what factors do they depend?	1M	5	1
	x. Calculate the stepping angle for a 2-phase, 4-pole stator, 6-tooth rotor.	1M	5	1
Q.2(A)	Calculate the induced emf per phase of a 10-pole, 3-phase, 50 Hz alternator with 2 slots per pole per phase and 4 conductors per slot in two layers. The coil span is 150° . The flux per pole has a fundamental component of 0.12 wb and a 20 % 3 rd harmonic component.	10M	1	3
OR				
Q.2(B)	For a 3-phase alternator, develop the formulas for i. Pitch-factor ii. Distribution factor iii. Winding factor	10M	1	3
Q.3(A)	What is armature reaction? Explain with relevant phasor diagram, the effect of armature reaction on the terminal voltage of an alternator at (i) UPF load (ii) lagging ZPF load and (iii) leading ZPF load	10M	2	3
OR				
Q.3(B)	What are the conditions to be satisfied before connecting an alternator to the infinite bus-bars? Explain, with any method of synchronizing.	10M	2	3
Q.4(A)	Draw the equivalent circuit diagram and phasor diagram of a 3-phase synchronous motor for lagging, leading and unity power factor conditions. Name all the phasors.	10M	3	3
OR				
Q.4(B)	A 2.3 KV, 3-phase, star connected synchronous motor has an impedance, $Z=0.2+j2.2$ ohms per phase. The motor is operating at 0.5 power factor leading with a line current of 200A. Determine the generated end per phase.	10M	3	3

Q.5(A)	Explain the speed control methods of 3-phase induction motor.	10M	4	2
OR				
Q.5(B)	The power input to the rotor of a 440V, 6 pole, 50 Hz, 3-ph induction motor is 60kw. It is observed that the rotor emf makes 90 complete cycles per minute. Calculate (a) slip (b) rotor copper losses (c) rotor speed and (d) mechanical power developed.	10M	4	3
<hr/>				
Q.6(A)	i. Explain construction and working principle of Stepper motor.	5M	5	3
	ii. Explain construction and working principle of reluctance motor.	5M	5	3
OR				
Q.6(B)	Using double revolving field theory explain the torque slip characteristics of a single-phase Induction motor.	10M	5	3

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations – May 2024

DIGITAL ELECTRONICS

(EEE)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Determine the value of x if $(193)_x = (623)_8$	1M	1	5
	ii. List out the properties of XOR gate.	1M	1	1
	iii. What is meant by don't care combinations.	1M	2	1
	iv. Draw the logic diagram of 4x1 multiplexer and write its truth table	1M	2	3
	v. Define Level trigger and Edge trigger.	1M	3	1
	vi. Write any two applications of shiftregister.	1M	3	2
	vii. Mention the advantages of TTL logic family.	1M	4	1
	viii. What do you mean by terms "fan in" and "fan out"?	1M	4	1
	ix. Differentiate between ROM and RAM.	1M	5	2
	x. Compare PLAs and PALs.	1M	5	2
Q.2(A)	Why the NAND and NOR gates are called Universal gates and construct the AND, OR, NOT and EXOR gates with universal gates.	10M	1	3
OR				
Q.2(B)	Perform the subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend.	10M	1	3
	i. 11010 – 10110			
	ii. 11011 - 1001			
	iii. 100 – 110100			
	iv. 1010101 - 1010101			
Q.3(A)	Design a logic circuit to convert BCD to gray code	10M	2	6
OR				
Q.3(B)	i. Obtain the simplified expression in sum of products for the following Boolean function $BDE+B'C'D+CDE+A'B'CE+A'B'C+B'C'D'E'$.	5M	2	5
	ii. Simplify the following Boolean function with the don't care conditions using K-map method $f(A, B, C, D) = \sum m(1,3,8,10,15) + \sum d(0, 2, 9)$	5M		
Q.4(A)	Design mod-10 synchronous counter using D-FlipFlop/T-FlipFlop.	10M	3	6

OR

- Q.4(B) Reduce the number of states in the following state table and tabulate the reduced state table. 10M 3 3

Present State	Next State	
	X=0	X=1
a	f,0	b,0
b	d,0	c,0
c	f,0	e,0
d	g,1	a,0
e	d,0	c,0
f	f,1	b,1
g	g,0	h,1
h	g,1	a,0

-
- Q.5(A) With the help of neat circuit diagram and truth table explain the working of a two input DTL NAND and RTL NAND gates. 10M 4 2
- OR**
- Q.5(B) Illustrate the operation of two input CMOS NAND and NOR gates using necessary diagrams. 10M 4 3
-
- Q.6(A) Describe the structure of Programmable Logic Array (PLA). Take a simple example and explain. 10M 5 2
- OR**
- Q.6(B) Discuss any two types of programming technology used in FPGA design. 10M 5 2

*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May – 2024

ELECTROMAGNETIC FIELDS

(Electrical and Electronics Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No.	Question	Marks	CO	BL
Q.1	i. Find the unit vectors in the direction of sum of vectors $\vec{a} = 2\vec{i} - \vec{j} + 2\vec{k}$, $\vec{b} = -\vec{i} + \vec{j} + 3\vec{k}$	1M	1	2
	ii. Write down the expression for conversion of Cylindrical to Cartesian system	1M	1	1
	iii. Poisson's equation is given as a. $E = -\nabla^2 V$ b. $\nabla^2 V = -\rho v/\epsilon$ c. $\nabla^2 V = 0$ d. All	1M	2	2
	iv. Define Coulomb's law	1M	2	1
	v. Lorentz force equation comprises _____ and _____ forces. a. Electric, magnetic b. Mechanical, chemical c. Both (a) and (b) d. None of these	1M	3	1
	vi. Define Amperes Circuital Law	1M	3	1
	vii. Write the equation for Stroke's theorem	1M	4	2
	viii. Differentiate displacement current and electric current	1M	4	4
	ix. Mention the properties of uniform plane wave.	1M	5	1
	x. Classify the types of Polarization	1M	5	2
Q.2(A)	Explain the method of converting a vector from Cartesian to Cylindrical system with neat diagram	10M	1	2
OR				
Q.2(B)	(i) If $\vec{A} = x^2y\vec{i} - xyz\vec{j} + yz^2\vec{k}$ determine divergence of \vec{A} at point (1,2,3)	5M	1	4
	(ii) $\vec{A} = (y^4 - x^2z^2)\vec{i} + (x^2+y^2)\vec{j} - (x^2yz)\vec{k}$ determine Curl \vec{A} at (1,3,-2)	5M		
Q.3(A)	Let $\vec{D} = 4x^2\vec{a}_x - 2y\vec{a}_y + 2z\vec{a}_z$ using gauss law, find the total charge enclosed by the region $-a < x, y, z < a$.	10M	2	2
OR				
Q.3(B)	The capacitance of the conductor formed by the two parallel metal sheets, each 200 cm ² , in area separated by a dielectric 2mm thick is 0.001 micro farads. A potential of 20KV is applied to it. Find (i) Electric flux (ii) Potential gradient in kV/m (iii) The relative permittivity of materials (iv) Electric flux density.	10M	2	1
Q.4(A)	State and explain Biot savart Law with neat sketch	10M	3	2

OR

Q.4(B)	Distinguish between self-inductance and mutual inductance with suitable diagram	10M	3	4
Q.5(A)	State Maxwell's equation in both point and integral form for conducting medium and free space.	10M	4	2
OR				
Q.5(B)	(i) State and Prove divergence theorem.	5M	4	2
	(ii) A long solenoid has 500 turns. When a current of 2 A is passed through it, the resulting magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. find self-inductance.	5M		
Q.6(A)	Suppose the electric field amplitude of an electromagnetic wave is $E_0 = 120$ N/C and the frequency is $\nu = 50.0$ MHz (i) Determine, B_0 , ω , K , and λ , (ii) Find the expression for E and B.	10M	5	3
OR				
Q.6(B)	Illustrate the following: (i) Plane Waves in Lossless Dielectrics (ii) Plane wave in Free Space (iii) Plane Wave in Good conductors	10M	5	3
*** END***				

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

CONTROL SYSTEMS

(EEE)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. In Force- Voltage analogy Spring constant (K) is analogous to	1M	1	1
	ii. In Force- current analogy velocity (v) is analogous to	1M	1	
	iii. What is the type of a system? What is its significance?	1M	2	2
	iv. A unity feedback system has a open loop transfer of $G(s) = \frac{10}{(s+1)(s+2)}$ Determine the steady state error for unit step input.	1M	2	3
	v. What are the break-away and break-in points?	1M	3	1
	vi. What is Effect of stability of the system, if poles are added to open loop transfer function.	1M	3	2
	vii. Define the gain cross over frequency and phase cross over frequency.	1M	4	1
	viii. Discuss the difference between controller and compensator.	1M	4	2
	ix. List any two advantages of state space model over the transfer function model.	1M	5	1
	x. List any three properties of a state transient matrix.	1M	5	1
Q.2(A)	Explain the open loop and closed control systems with at least two examples.	10M	1	2
OR				
Q.2(B)	Using block diagram reduction technique find the closed loop transfer function of the system shown in figure. And verify the result using signal flow graph technique.	10M	1	3
Q.3(A)	I Explain the Time domain specifications II Derive the formula for rise time.	5M 5M	2	2
OR				
Q.3(B)	A unity feedback system has open loop transfer function $(s) = \frac{4}{s(s+1)}$. Find the time domain specifications.	10M	2	3
Q.4(A)	Construct the Routh array and determine the stability of the system whose characteristic equation is $S^6 + 2S^5 + 8S^4 + 12S^3 + 20S^2 + 16S + 16 = 0$. Also determine the number of roots lying on the right half of S-plane and on the imaginary axis.	10M	3	4

OR

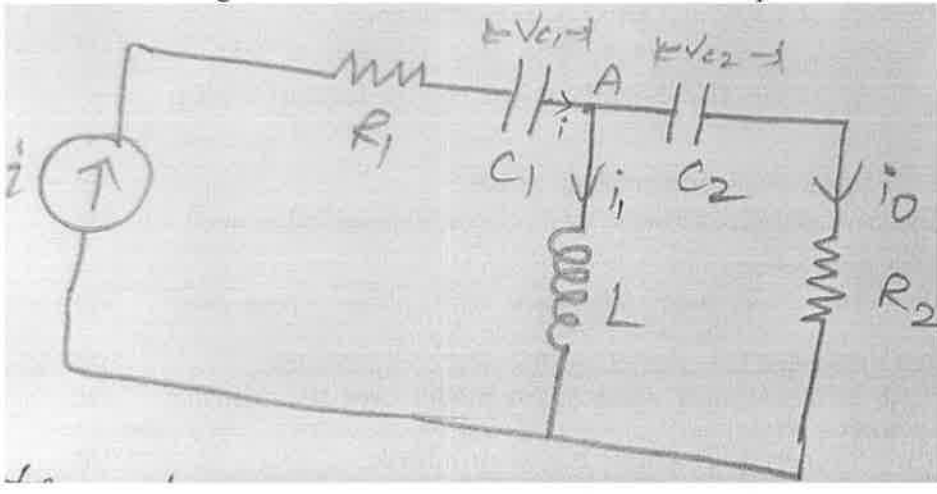
Q.4(B) Sketch the root locus of the system whose open loop transfer function is given by $G(s) = \frac{K}{s(s+2)(s+4)}$. Analyse the range of K for which system is to be stable. 10M 3 4

Q.5(A) The open loop transfer function of a unity feedback control system is $G(s) = 1/s^2(1+s)(1+2s)$. Sketch the polar plot and determine gain margin and phase margin. 10M 4 3

OR

Q.5(B) Sketch the Bode plot for the Transfer Function $G(s) = 10/s(1+0.4s)(1+0.1s)$ and determine gain margin and phase margin. 10M 4 4

Q.6(A) Obtain state space model of electrical network shown in fig. Consider Current through the resistance R2 as output variable. 10M 5 3



OR

Q.6(B) Obtain the Transfer function of the system whose state space model is given by 10M 5 4

$$\begin{bmatrix} \frac{dx_1}{dt} \\ \frac{dx_2}{dt} \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t), \quad Y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + 0(D).$$

Also obtain state transient matrix for above state space model?

***** END*****

Hall Ticket No:

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Question Paper Code: 20HUM101

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024
ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS
(Common to ME, CSE, CSE-AI, CSE-DS, CSE-IOT, CSE-CS)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What do you mean by scarcity?	1M	1	1
	ii. Demonstrate law of supply	1M	1	2
	iii. Write opportunity cost	1M	2	2
	iv. Discuss ISO cost	1M	2	2
	v. What is market?	1M	3	1
	vi. Define duopoly	1M	3	1
	vii. Construct Proforma of Ledger	1M	4	2
	viii. What is Book -Keeping	1M	4	1
	ix. Outline of liquidity ratio	1M	5	2
	x. Outline of Capital Rationing	1M	5	2
Q.2(A)	What is elasticity of demand? Illustrative Types price elasticity of demand.	10M	1	2
OR				
Q.2(B)	Examine various problems of scarcity and choice	10M	1	4
Q.3(A)	Explain economies and diseconomies of scale	10M	2	2
OR				
Q.3(B)	List out Breakeven point assumptions and importance.	10M	2	3
Q.4(A)	What is monopoly? Examine price output determination under monopoly	10M	3	2
OR				
Q.4(B)	Describe pricing Methods and objectives in brief	10M	3	2
Q.5(A)	Elucidate any five Accounting Concepts with suitable examples	10M	4	3
OR				
Q.5(B)	Construct trading a/c, profit & loss a/c and balance sheet for the year ended 31-6-2015	10M	4	4

Particulars	Rs Dr	Rs. Cr
Capital		40000
Bank	4000	
Machinery	6000	
Creditors		8000
Purchases	5000	
Purchase returns		1000
Sales		10000
Sales returns	1000	
Rent	2000	
Wages	4000	
Salary	5000	
Discount	3000	
Office expenses	10000	
Debtors	12000	
Bills receivables	7000	
Total	59000	59000

Adjustments

1. Closing stock Rs. 8000
2. Outstanding salary Rs. 1000
3. Prepaid rent Rs. 500
4. Depreciation 10% on machinery

Q.6(A) What is ratio? How do you categorize different types of ratios 10M 5 2

OR

Q.6(B) A company is an investment proposal to install new milling controls. The project will cost Rs. 50000. The estimated cash flows before tax are as follows: 10M 5 4

Year	CFAT
1	10000
2	14000
3	16000
4	20000
5	22000

Cost of capital @12%
Years: 1-0.893, 2-0.797, 3-0.712,
4-0.636 and 5-0.567

Evaluate: (i) Payback period, (ii) NPV and (iii) IRR

***** END*****

Hall Ticket No:

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Question Paper Code: 20ME108

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

MANUFACTURING TECHNOLOGY - 1

(Mechanical Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What is gating ratio in casting process.	1M	1	1
	ii. What is draft allowance?	1M	1	1
	iii. What is thermit in thermit welding process.	1M	2	1
	iv. Classify NDT methods.	1M	2	1
	v. Define blanking operation of sheet metal.	1M	3	1
	vi. List any two important characteristics of sheet metal.	1M	3	1
	vii. Define extrusion.	1M	4	1
	viii. Define rolling process of metals.	1M	4	1
	ix. What are secondary operations in powder metallurgy process.	1M	5	1
	x. List the different processing techniques of metal matrix composites.	1M	5	1
Q.2(A)	With the help of flow chart, explain different stages of casting process. List the advantages and limitations of casting process.	10M	1	2
OR				
Q.2(B)	Explain the types of patterns and pattern materials.	10M	1	2
Q.3(A)	With the help of neat sketch, explain the principle of electric arc welding process. List the advantages and limitations of welding process.	10M	2	2
OR				
Q.3(B)	With the help of neat sketch, explain the principle of spot welding process. List the applications of welding process.	10M	2	2
Q.4(A)	With the help of neat sketch, classify and explain different types of sheet metals operations.	10M	3	2
OR				
Q.4(B)	Explain the principle of hydraulic press of sheet metal process using a neat sketch. List the applications of sheet metal.	10M	3	2
Q.5(A)	Explain the principle of impression die forging operations using neat sketch. Compare hot forging and cold forging process.	10M	4	2
OR				
Q.5(B)	Explain the principle of tube drawing process using a sketch. List the applications of drawing process.	10M	4	2
Q.6(A)	Explain the stages involved in powder metallurgy process. List its applications.	10M	5	2
OR				
Q.6(B)	List the PMC processing techniques, with the help of neat sketch, explain the principle of hand lay-up process.	10M	5	2

*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

PROBABILITY AND STATISTICS

(Mechanical Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL																		
Q.1	i. If $P(A) = 0.6$, $P(A \cup B) = 0.8$ and A, B are independent events, then $P(B) = ?$	1M	1	2																		
	ii. Define probability density function.	1M	1	1																		
	iii. If X is a random variable with $V(X) = 5$, then $V(4X+8)$?	1M	2	2																		
	iv. Let X be a binomial random variable with $n=5$ and $q=0.2$. Find the variance of X.	1M	2	2																		
	v. Define gamma distribution.	1M	3	1																		
	vi. Define Hazard's rate.	1M	3	1																		
	vii. What is Type I error in sampling.	1M	4	1																		
	viii. Define the F – statistic.	1M	4	1																		
	ix. What is experimental error?	1M	5	1																		
	x. Give an example of a 4×4 Latin square design.	1M	5	1																		
Q.2(A)	A computer center has three printers A, B, and C, which print at different speeds. Programs are routed to the first available printer. The probability that a program is routed to printers A, B and C are 0.6, 0.3 and 0.1 respectively. Occasionally a printer will jam and destroy the printout. The probability that printers A, B and C will jam are 0.01, 0.05 and 0.04 respectively. Your program is destroyed when a printer jams. What is the probability that printer A is involved? Printer B involved? Printer C involved?	10M	1	3																		
OR																						
Q.2(B)	Let X denote, the number of holes that for can be drilled per bit. The density for X is given the following table:	10M	1	2																		
	<table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="padding: 2px;">x</td><td style="padding: 2px;">1</td><td style="padding: 2px;">2</td><td style="padding: 2px;">3</td><td style="padding: 2px;">4</td><td style="padding: 2px;">5</td><td style="padding: 2px;">6</td><td style="padding: 2px;">7</td><td style="padding: 2px;">8</td></tr><tr><td style="padding: 2px;">$f(x)$</td><td style="padding: 2px;">0.02</td><td style="padding: 2px;">0.03</td><td style="padding: 2px;">0.05</td><td style="padding: 2px;">0.2</td><td style="padding: 2px;">0.4</td><td style="padding: 2px;">0.2</td><td style="padding: 2px;">0.07</td><td style="padding: 2px;">$f(8)$</td></tr></table>	x	1	2	3	4	5	6	7	8	$f(x)$	0.02	0.03	0.05	0.2	0.4	0.2	0.07	$f(8)$			
x	1	2	3	4	5	6	7	8														
$f(x)$	0.02	0.03	0.05	0.2	0.4	0.2	0.07	$f(8)$														
	a) Find $f(8)$																					
	b) Find the table for F																					
	c) Use F to find the probability that a randomly selected bit can be used to drill between three and five holes inclusive.																					
	d) Find $p(X \leq 4)$ and $p(X < 4)$. Are these probabilities the same?																					
Q.3(A)	During one stage in the manufacture of IC chips, a coating must be applied. If 70% of chips receive a thick enough coating, find the probability that, among 15 chips, (i) at least 12 will have thick enough coatings, (ii) at most 5 will have thick enough coatings and (iii) exactly 10 will have thick enough coatings.	10M	2	2																		
OR																						
Q.3(B)	Among diabetic, the fasting blood glucose level X may be assumed to be approximately normally distributed with mean 106 milligrams and S. D. 8 milligrams.	10M	2	3																		
	a) Find the probability that randomly selected diabetic will have blood glucose level between 90 and 122 mg.																					
	b) Find $P[X \leq 120\text{mg}]$																					
	c) Find the point that has the property that 25% of all diabetic have a fasting glucose level of this value or lower.																					
		10M	3	3																		

- Q.4(A) Let X be a Weibull random variable with parameters α and β . Show that the mean and variance of X are given by $\mu = \alpha^{-\frac{1}{\beta}}\Gamma(1 + \frac{1}{\beta})$ and $\sigma^2 = \alpha^{-\frac{2}{\beta}}\Gamma(1 + \frac{2}{\beta}) - \mu^2$.

OR

- Q.4(B) The joint density for (X, Y) is shown in the following table. 10M 3 4

x/ y	0	1	2	3
0	0.840	0.030	0.020	0.010
1	0.060	0.010	0.008	0.002
2	0.010	0.005	0.004	0.001

- (a) Find $P(X \leq 1, Y = 1)$; $P(X = 2, Y \leq 1)$.
 (b) Find the Marginal densities for X and Y .
 (c) Find $P(X \leq 1)$ and $P(Y \leq 1)$.

- Q.5(A) Obtain the line of regression Y on X and estimate Y when $X = 45$ for the following data: 10M 4 3

X	56	42	72	36	63	47	38	68
Y	147	125	160	118	149	128	115	152

OR

- Q.5(B) Two random samples gave the following results: 10M 4 3

Sample number	Size	Sample Mean	Sum of the squares of the mean deviations
1	10	15	90
2	12	14	108

Examine whether the samples come from the same normal population.

- Q.6(A) Three different machines are used for production. Based on the outputs, set up a one-way ANOVA table and test whether the machines are equally effective. 10M 5 4

OUTPUTS		
MACHINE - I	MACHINE - II	MACHINE - III
10	9	20
15	7	16
11	5	10
10	6	14

OR

- Q.6(B) To study the performance of three detergents and three different water temperatures, the following 'whiteness' readings were obtained using the desired equipment 10M 5 5

WATER TEMPERATURE	DETERGENT A	DETERGENT B	DETERGENT C
COLD WATER	57	55	67
WARM WATER	49	52	68
HOT WATER	54	46	58

Perform a two-way analysis of variance using 5% level of significance.

*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

MECHANICS OF SOLIDS

(Mechanical Engineering)

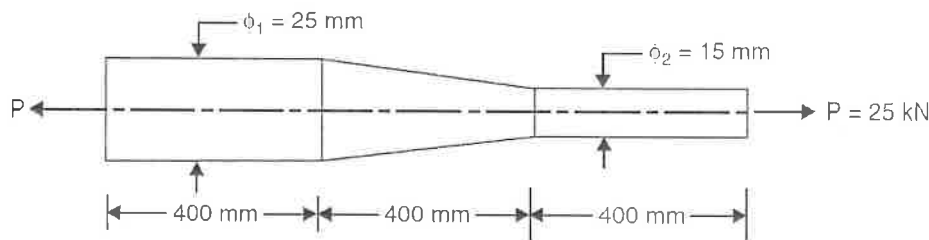
Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

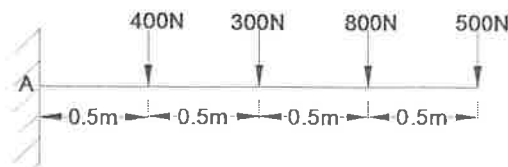
Q.No	Question	Marks	CO	BL
Q.1	i. Define Poisson's ratio.	1M	1	1
	ii. What is principle of superposition?	1M	1	1
	iii. Define beam and list the different types of beams	1M	2	1
	iv. What is meant by Shear force & Bending Moment?	1M	2	1
	v. Define flexural rigidity.	1M	3	1
	vi. Where will be the maximum bending moment in simply supported beam?	1M	3	2
	vii. Define torsional rigidity of a shaft.	1M	4	1
	viii. What is meant by Section Modulus?	1M	4	2
	ix. What is the effective length of a column?	1M	5	1
	x. Define Slenderness Ratio?	1M	5	1

Q.2(A)	Find the extension of the bar shown in Fig. under an axial load of 25 kN.	10M	1	4
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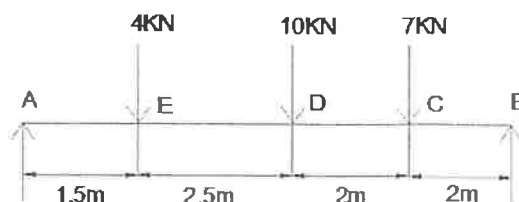
**OR**

Q.2(B)	A circular rod of 25 mm diameter and 500 mm long is subjected to a tensile force of 60 kN. Determine modulus of rigidity, bulk modulus and change in volume if Poisson's ratio = 0.3 and Young's modulus $E = 2 \times 10^5 \text{ N/mm}^2$	10M	1	4
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Q.3(A)	A cantilever beam of length 2 m carries the point loads as shown in Fig. Draw the shear force and B.M. diagrams for the cantilever beam.	10M	2	3
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**OR**

Q.3(B)	A simply supported beam carrying number of point loads as shown in figure.	10M	2	3
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Q.4(A)	State the assumption made in the theory of simple bending equation and derive the simple bending equation.	10M	3	3
OR				
Q.4(B)	Calculate Bending Stress for a simply supported beam 6m in span. The width of the beam is 300mm and depth is 600mm.the beam carries a udl of 40KN/m over the Entire Span.	10M	3	4
Q.5(A)	Derive an Expression for Torsion Equation with an assumption.	10M	4	3
OR				
Q.5(B)	What must be the length of a 5 mm diameter aluminum wire so that it can be twisted through one complete revolution without exceeding a shearing stress of 42 MN/m ² ? Take: C = 27 GN/m ²	10M	4	3
Q.6(A)	A solid round bar 60 mm in diameter and 2.5 m long is used as a strut. One end of the strut is fixed, while its other end is hinged. Find the safe compressive load for this strut, using Euler's formula. Assume E = 200 GN/m ² and factor of safety = 3.	10M	5	3
OR				
Q.6(B)	Derive the Euler's formula for the given conditions of one end fixed and another end free.	10M	5	4

***** END*****

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

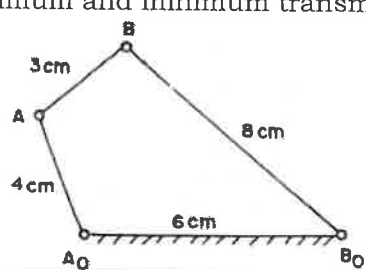
THEORY OF MACHINES

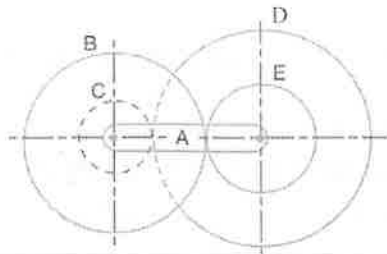
(Mechanical Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What is Kutzbach's criterion for degree of freedom of plane mechanisms?	1M	1	2
	ii. Show that slider crank mechanism is a modification of the basic four bar mechanism.	1M	1	3
	iii. What do you understand by the instantaneous center of rotation in kinematic of machines?	1M	2	2
	iv. How the coriolis component of acceleration arises when a point is rotating about some other fixed point and at the same time its distance from the fixed point varies	1M	2	3
	v. Define i) path of contact ii) Arc of contact	1M	3	1
	vi. What are the applications of gyroscopic couple?	1M	3	2
	vii. Why rotating masses are to be dynamically balanced?	1M	4	2
	viii. What are the various types of motions of follower motion?	1M	4	1
	ix. Sketch the different modes of the vibrations of a double rotor.	1M	5	3
	x. Define whirling speed of the shaft.	1M	5	1
Q.2(A)	Sketch and explain any two inversions of a double slider crank chain.	10M	1	3
	OR			
Q.2(B)	The mechanism shown in below is driven by turning AoA. Find out geometrically the maximum and minimum transmission angles.	10M	1	3
				
Q.3(A)	In a pin jointed four bar mechanism, the following dimensions are AB = 1.5 m, BC = 3 m, CD = 2.5 m, and AD (fixed link) = 4 m. The angle BAD = 60°. The crank AB rotates uniformly at 25 rpm. Locate all the instantaneous centers and find the angular velocity of the link BC and CD.	10M	2	3
	OR			
Q.3(B)	The crank of a slider crank mechanism rotates clockwise at a constant speed of 150 rpm. The crank is 200 mm and the connecting rod is 700 mm long. Determine the angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead center position.	10M	2	3
Q.4(A)	Derive an expression to determine the length of path of contact between two spur gears of different sizes.	10M	3	3
	OR			
Q.4(B)	In a reverted epicyclic gear train, the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 r.p.m. clockwise.	10M	3	3



- Q.5(A) A cam, with a minimum radius of 50 mm, rotating clockwise at a uniform speed, is required to give a knife edge follower the motion as described below:
1. To move outwards through 40 mm during 100° rotation of the cam;
 2. To dwell for next 80°;
 3. To return to its starting position during next 90°, and
 4. To dwell for the rest period of a revolution i.e. 90°.
- Draw the profile of the cam when the line of stroke of the follower passes through the center of the cam shaft. The displacement of the follower is to take place with uniform acceleration and uniform retardation.
- OR**
- Q.5(B) A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions.
-
- Q.6(A) Explain the following:
- (i) Define degrees of freedom.
 - (ii) Distinguish free vibrations, forced vibrations & Damped Vibration
 - (iii) Differentiate with an example (a) Longitudinal (b) Transverse (c) Torsional vibrations.
- OR**
- Q.6(B) A machine part of mass 2 kg vibrates in a viscous medium. Determine the damping coefficient when a harmonic exciting force of 25 N results in a resonant amplitude of 12.5 mm with a period of 0.2 second. If the system is excited by a harmonic force of frequency 4 Hz what will be the percentage increase in the amplitude of vibration when damper is removed as compared with that with damping.
- *** END*****

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(UGC-AUTONOMOUS)

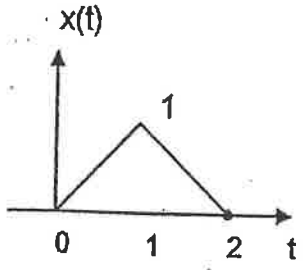
B.Tech II Year II Semester (R18) Supplementary End Semester Examinations – May 2024
(Regulations: R18)

PRINCIPLES OF SIGNALS AND SYSTEMS
(ECE)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either Part-A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Sketch the discrete time signal $x(n) = 4\delta(n+4) + \delta(n) + 2\delta(n-1)$.	1M	1	2
	ii. Test the signal $x(n) = e^{j6\pi n}$ is periodic or not.	1M	1	2
	iii. How to find out the impulse response of a CT-LTI system?	1M	2	2
	iv. Test whether the system $y(n) = \cos(x(n))$ is stable or not.	1M	2	2
	v. What is the difference between DFT and DTFT?	1M	3	2
	vi. Find the Fourier transform of $x(t) = e^{-at}u(t)$.	1M	3	2
	vii. What is the Laplace transform of $te^{-at}u(t)$?	1M	4	2
	viii. Find the Z transformation of $x(n) = a^n u(n)$.	1M	4	2
	ix. Define band limited signal.	1M	5	1
	x. What is aliasing effect?	1M	5	1
Q.2(A)	Check whether the system $y(n) = \log(x(n))$ is (i) Static or dynamic (ii) Linear or nonlinear (iii) Time-invariant or time-variant (iv) Causal or non-causal	10M	1	3
OR				
	(i) A continuous-time signal $x(t)$ is shown below.	6M	1	3
Q.2(B)	 <p>Sketch $y(t) = x(-0.5t + 2)$.</p>			
	(ii) Find the even and odd part of the signal given by $x(t) = e^{at}$.	4M		3
Q.3(A)	Compute the output $y(t)$ for a continuous time LTI system whose impulse response $h(t)$ and the input $x(t)$ are given by $x(t) = u(t) - u(t-3)$ and $h(t) = u(t) - u(t-2)$.	10M	2	4

OR

Q.3(B)	(i) Use graphical method to find out the convolution of two sequences $x_1(n) = \{1, -4, 2, 3\}$ and $x_2(n) = \{1, -2, 3, -1\}$.	7M	2	3
	(ii) State and prove any two properties of convolution.	3M		3

Q.4(A)	State and prove any four properties of continuous time Fourier transformation.	10M	3	3
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OR

Q.4(B)	(i) Write the Dirichlet's conditions for Fourier series.	4M	3	2
	(ii) Compute DTFT for the following sequence	6M		3
	a) $x(n) = 0.5^n u(n)$			
	b) $x(n) = 2^n u(-n)$			
	c) $x(n) = 0.5^n u(-n)$			

Q.5(A)	(i) Discuss the linearity and time shifting properties of Laplace transform.	4M	4	2
	(ii) Find out the Laplace transformation of the signal given by $x(t) = e^{-\alpha t} u(t) + e^{-\beta t} u(-t)$.	6M		3

OR

Q.5(B)	(i) Discuss the properties of ROC for Z- transformation.	4M	4	2
	(ii) Find the inverse Z-transform of $X(z) = \frac{z(z+3)}{(z-1)(z-2)(z-3)}$	6M		3
	for $2 < z < 3$.			

Q.6(A)	State and explain sampling theorem both in time and frequency domain with necessary quantitative analysis and illustration.	10M	5	3
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OR

Q.6(B)	Write short notes on	10M	5	2
	(i) Zero-order hold			
	(ii) First order hold.			

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B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

MICROPROCESSORS AND MICROCONTROLLERS

(ECE)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Mark	CO	BL
Q.1	i. What is meant by pipelining?	1M	1	2
	ii. Write down the addressing mode of the instruction MOV AX, 55H [BX] [SI].	1M	1	3
	iii. What is meant by key bouncing?	1M	2	1
	iv. Draw the format of Read back Command register of 8254.	1M	2	3
	v. Which ports of 8051 are bit addressable?	1M	3	2
	vi. Outline the function of CJNE, DJNZ instruction.	1M	3	3
	vii. How many operating modes does ARM have?	1M	4	1
	viii. Write at least three barrel shifter instruction in ARM.	1M	4	2
	ix. Write the stepping sequence of the stepper motor under full-drive mode.	1M	5	3
	x. What is HAL stands for?	1M	5	1
Q.2(A)	Describe in detail about each addressing mode with an example.	10M	1	2
OR				
Q.2(B)	Write an 8086 Assembly Language Program to sort the array of numbers in ascending and descending order.	10M	1	3
Q.3(A)	Explain the Functional diagram of Programmable Interrupt Controller in detail.	10M	2	1
OR				
Q.3(B)	Draw the block diagram of the 8279 Keyboard/Display interface and explain.	10M	2	2
Q.4(A)	Illustrate the architectural features of 8051 microcontroller with necessary diagram.	10M	3	1
OR				
Q.4(B)	Discuss in detail about the instruction sets of 8051 microcontroller.	10M	3	2
Q.5(A)	With a neat diagram explain the different hardware components of an embedded device based on ARM core.	10M	4	3
OR				
Q.5(B)	Explain ARM pipeline with 3,5 and 6 stages in detail.	10M	4	2
Q.6(A)	Develop a complete program and draw an interfacing diagram to display the strings 'MICROCONTROLLER' on the LCD which is interfaced with the 8051 Microcontroller. Assume that the strings are stored at the RAM address starting 9000H.	10M	5	3
OR				
Q.6(B)	Draw the simple sketch of an 8-bit DAC interface with 8051 microcontroller and develop an assembly language program to generate a square wave.	10M	5	3

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024
PROBABILITY THEORY AND STOCHASTIC PROCESSES

(Electronics & Communication Engineering)

Time 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. A single card is drawn from a 52 card deck. What is the probability that the card is a red 10?	1M	1	2
	ii. Define independence of two events?	1M	1	1
	iii. A continuous random variable X having probability distribution function $F_X(x) = (1 - e^{-x^2})$. Find its density function.	1M	2	2
	iv. Define characteristic function of a random variable?	1M	2	1
	v. Given the function $f_{X,Y}(x,y) = b(x+y)^2$; $-1 < x < 1$ and $-3 < y < 3$. Find the constant b such that this is a valid joint density function.	1M	3	2
	vi. Variances $\sigma_X^2 = 6$ and $\sigma_Y^2 = 9$; correlation coefficient $\rho_{XY} = -2/3$. Find the covariance C_{XY}	1M	3	2
	vii. Define monotonic transformation of a continuous random variable?	1M	4	1
	viii. State the Central limit theorem?	1M	4	1
	ix. State the Ergodic theorem?	1M	5	1
	x. Define the power spectral density?	1M	5	1
Q.2(A)	In a binary communication system transmitted symbols 1 and 0. Define appropriate events A_i and B_j , $i=1,2$ to represent symbols after and before channel respectively. Assume channel transition probabilities are all equal at $P(A_i B_j) = 0.1$, $i \neq j$ and are $P(A_i B_j) = 0.9$ for $i = j = 1,2$, while symbol transmission probabilities are $P(B_1) = 0.6$ and $P(B_2) = 0.4$. (a) Compute the received symbol probabilities $P(A_1)$ and $P(A_2)$? (b) Compute the posterior probabilities for the system?	10M	1	3
	OR			
Q.2(B)	(i) In a communication system the signal sent from point 'a' to point 'b' arrives by two paths in parallel. Over each path the signal passes through two repeaters (in series). Each repeater in one path has a probability of failing (becoming an open circuit) of 0.005. The probability is 0.008 for each repeater on the other path. All repeaters fail independently of each other. Find the probability that the signal will not arrive at point 'b'?	10M	1	2
	(ii) In a large hotel it is known that 99% of all guests return room keys when checking out. If 250 engineers check out after a large conference, what is the probability that not more than three will fail to return their keys?			
Q.3(A)	(i) A random variable X has the distribution function $F_X(x) = \sum_{n=1}^{12} \frac{n^2}{650} u(x-n)$ Find (a) $P(-\infty < X \leq 6.5)$ (b) $P(X > 4)$ and (c) $P(6 < X \leq 9)$.	10M	2	3

(ii) In a certain "junior" Olympics, Javelin throw distances are well approximated by a Gaussian distribution for which $a_X = 30m$ and $\sigma_X = 5m$. In a qualifying round, contestant must throw farther than 26 m to qualify. In the main event the record throw is 42 m. (a) what is the probability of being disqualified in the qualifying round? And (b) In the main event what is the probability the record will be broken?

OR

Q.3(B) Derive moment generating function of Gaussian distribution and find its mean and variance. 10M 2 4

Q.4(A) Given the function $f_{X,Y}(x,y) = b(x+y)^2$; $-1 < x < 1$ and $-3 < y < 3$. (a) Find the constant b such that this is a valid joint density function. (b) Determine the marginal density functions $f_X(x)$ and $f_Y(y)$. 10M 3 3

OR

Q.4(B) Two random variables X and Y are related by the expression $Y = aX + b$; where a and b are any real numbers. 10M 3 3

(a) Show that $\rho = \begin{cases} 1 & \text{if } a > 0 \text{ for any } b \\ -1 & \text{if } a < 0 \text{ for any } b \end{cases}$

(b) Show that their covariance is $C_{X,Y} = a\sigma_X^2$

Q.5(A) State and Prove Chebychev's inequality? 10M 4 3

OR

Q.5(B) Gaussian random variables X and Y have first and second order moments $\bar{X} = -1.0, \bar{X}^2 = 1.16, \bar{Y} = 1.5, \bar{Y}^2 = 2.89$. Find (a) C_{XY} (b) ρ . Also find the angle θ of a coordinate rotation that will generate new random variables that are statistically independent. 10M 4 3

Q.6(A) (i) Show that the random process $X(t) = A \cos(\omega_0 t + \Theta)$ is wide sense stationary if it is assumed that A and ω_0 and Θ is a uniformly distributed random variable on the interval $(0, 2\pi)$. (ii) The auto correlation function of a stationary random process $X(t)$ is given by $R_{XX}(\tau) = 25 + \frac{4}{1+6\tau^2}$. Find the mean, mean square and variance of the process. 10M 5 3

OR

Q.6(B) Find the autocorrelation function and spectral density function of a random process $X(t) = A \cos(\omega_0 t + \Theta)$ where Θ a random variable is over the ensemble and is uniformly distributed over the interval $(0, 2\pi)$. Also find the average power? 10M 5 3

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B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

CONTROL SYSTEMS ENGINEERING

(Electronics and Communication Engineering)

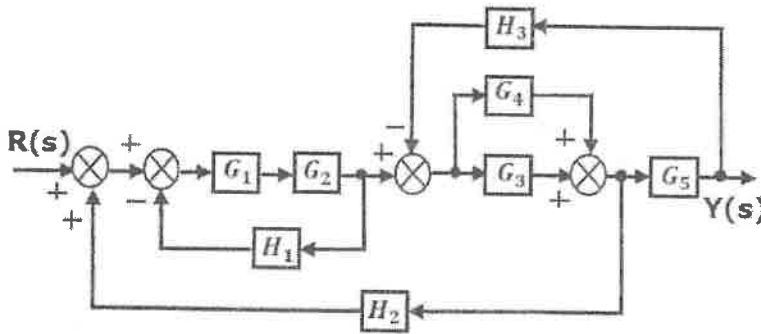
Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

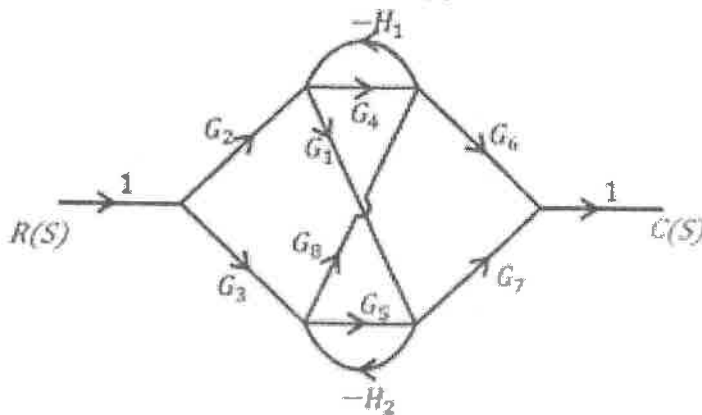
Q.No	Question	Marks	CO	BL
Q.1	i. Define transfer function.	1M	1	1
	ii. What are the basic elements used for modelling mechanical translational system?	1M	1	1
	iii. What is the order of a system?	1M	2	1
	iv. Define settling time.	1M	2	1
	v. Define controller and list types of controllers.	1M	3	1
	vi. What are asymptotes?	1M	3	1
	vii. Define phase margin and gain margin.	1M	4	1
	viii. Define stability of a system if poles are located on the (i) RHP, (ii) LHP and (iii) imaginary axis	1M	4	1
	ix. State advantage of static space analysis.	1M	5	1
	x. List properties of transition matrix?	1M	5	1

Q.2(A) Evaluate the transfer function of the system shown in below figure using block reduction techniques. 10M 1 2

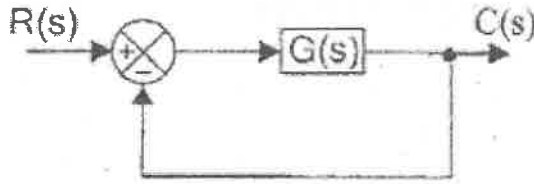


OR

Q.2(B) Using Mason's gain formula, obtain the overall gain of the system represented by signal flow graph shown in the below figure. 10M 1 2



- Q.3(A) Obtain the response of unity feedback system whose open loop transfer function is $G(s) = \frac{4}{s(s+5)}$ and when the input is unit step.



OR

- Q.3(B) Derive the expression for steady-state error of the closed-loop system in terms of generalized error coefficients.

- Q.4(A) The open loop transfer function of a unity negative feedback control system is given as $G(s) = \frac{K}{s(s+2)(s+4)}$. Sketch the root locus and find the value of K corresponding to crossing point on imaginary axis.

OR

- Q.4(B) By applying Routh criterion, determine the range of K for stability of unity feedback system whose open loop transfer function is $G(s) = \frac{K}{s(s+1)(s+2)}$.

- Q.5(A) The transfer function of a unity feedback control system is given below. Plot the Bode diagram and obtain the gain cross-over frequency (ω_{gc}), phase cross-over frequency (ω_{pc}).

$$G(s) = \frac{10}{s(1+0.1s)(1+0.4s)}$$

OR

- Q.5(B) Sketch the polar plot and determine the gain margin and phase margin for the open loop transfer function given by,

$$G(s) = \frac{1}{s(1+s)(1+2s)}$$

- Q.6(A) Discuss concept of observability. Evaluate the observability of the system.

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ -2 & -1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U(t)$$

$$\text{and } Y(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$$

OR

- Q.6(B) What is Controllability? Find the controllability of the system,

$$\dot{X} = \begin{bmatrix} 1 & 1 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U(t)$$

$$n = 2$$

*** END***

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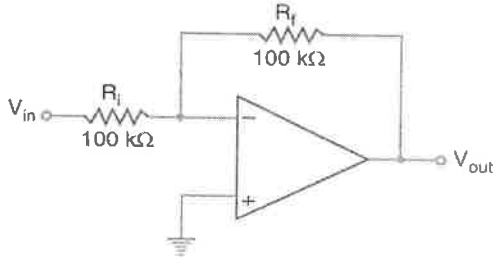
ANALOG CIRCUITS

(ECE)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL	
Q.1	i. Define the conduction angle for class-A power amplifier	1M	1	1	
	ii. Mention the difference between voltage and power amplifier.	1M	1	1	
	iii. Define positive and negative feedback	1M	2	1	
	iv. Calculate the frequency of Colpitts Oscillator. Given $C_1 = 0.01\mu\text{F}$, $C_2 = 0.1\mu\text{F}$ and $L = 1 \text{ mH}$.	1M	2	2	
	v. What is the "virtual ground" concept in an Op-Amp?	1M	3	1	
	vi. Find the output voltage (V_{out}) of the given circuit if input is 1V	1M	3	2	
					
	vii. Draw the frequency response of an active high-pass filter and mark the cut-off frequency.	1M	4	1	
	viii. State the difference between Narrow band and Wideband band pass filter.	1M	4	1	
	ix. What do you infer from line regulation for voltage regulators.	1M	5	1	
x. State line regulation for voltage regulators.	1M	5	1		
Q.2(A)	Describe in detail the small signal operation of BJT differential amplifier and derive A_d , A_c , and CMRR.	10M	1	2	
OR					
Q.2(B)	Illustrate the working of class-A power amplifier and obtain the power efficiency with neat diagram and waveforms.	10M	1	2	
Q.3(A)	Detail about the basic operation of Hartley oscillator with neat circuit diagram and discuss criteria to have oscillations with equations.	10M	2	2	
OR					
Q.3(B)	Draw the circuit diagram of a RC phase shift oscillator and calculate the cutoff frequency (f_c) and open loop gain (A) with the given values. Does it fulfill the Barkhausen criteria? Justify your answer. $R_f = 10k\Omega$, $R_1 = 1k\Omega$, $R = 2k\Omega$, $C = 10pF$	10M	2	3	
Q.4(A)	Differentiate between differentiator and integrator. Draw the circuit diagram of differentiator, input and output waveforms and explain its working principle, then find V_{out} .	10M	3	2	

OR

Q.4(B)	Elaborate the working principle of inverting and non-inverting amplifier. Draw the waveform of input and output and find the voltage gain of these circuits	10M	3	2
Q.5(A)	Draw the circuit of an active high-pass filter using op-amp, explain its operation. Derive equation for gain and draw the frequency response curve.	10M	4	2
OR				
Q.5(B)	Implement the mathematical operation of log and antilog amplifiers using op-amp with the help of neat circuit diagram and derive output voltage equation.	10M	4	2
Q.6(A)	In the context of DC regulated power supplies, how can u use fixed positive and negative voltage regulators for getting regulated output. Justify your explanation with circuit diagrams and table values.	10M	5	2
OR				
Q.6(B)	A 555 timer is to be configured in a mode where continuous changing of states are obtained from HIGH to LOW and from LOW to HIGH with components $R_A=2\text{kohm}$ $R_B=6\text{kohm}$ and $C=0.1\mu\text{F}$. Identify its mode of operation, determine the frequency of oscillation, draw the circuit diagram and waveforms also.	10M	5	4

***** END*****

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(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

DISCRETE MATHEMATICAL STRUCTURES
(Common to CSE, CSE (AI), CSE (DS), CSE (CS), and CST)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

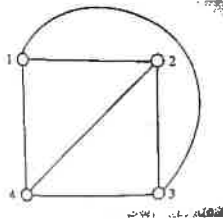
Q.No	Question	Marks	CO	BL
Q.1	i. Write the statement of inverse of the logical statement 'If ΔABC is equilateral, then it is isosceles'.	1M	1	1
	ii. Construct the truth value table for $(\neg P \rightarrow Q)$.	1M	1	1
	iii. State sum rule.	1M	2	1
	iv. Find $C(4, 2)$.	1M	2	1
	v. Give an example of a sub group of a group.	1M	3	1
	vi. Define co-set of a group.	1M	3	1
	vii. Write the Boolean algebra.	1M	4	1
	viii. Construct the Hasse Diagram for S_{30} .	1M	4	1
	ix. How do you obtain a subgraph from a given graph?	1M	5	1
	x. What is Minimum spanning tree?	1M	5	1
Q.2(A)	Explain different types of logical connectives with truth table for suitable example.	10M	1	2
OR				
Q.2(B)	(i) Show that $\neg(P \wedge Q)$ follows form $\neg P \vee \neg Q$. (ii) Explain NOT, AND, OR, NAND, and NOR gates.	10M	1	3
Q.3(A)	i) What is the minimum number of students required in a discrete mathematics class to be sure that at least six receive the same grade, if there are five possible grades A, B, C, D, and F? (ii) How many solutions does the equation $x_1 + x_2 + x_3 = 11$ have, where $x_1 \geq 1$, $x_2 \geq 2$, and $x_3 \geq 3$?	10M	2	3
OR				
Q.3(B)	(i) Define Binomial coefficient and find the coefficient of $x^{12}y^{13}$ in the expansion of $(x + y)^{25}$. (ii) How many solutions does the equation $x_1 + x_2 + x_3 = 11$, where x_1, x_2 , and x_3 are nonnegative integers.	10M	2	2
Q.4(A)	(i) Let G be group of order 2 in which $G = \{e, a\}$. Find $G \times G$, the direct product of G with itself. (ii) What is normal subgroup? Explain with a suitable example.	10M	3	3
OR				
Q.4(B)	(i) Derive English language of the sentence " a monkey ate the banana" is generated by the English grammar. (ii) Derive the language $L(G) = a^2b^2c^2$ is generated by the following grammar. $G = \langle \{S, B, C\}, \{a, b, c\}, S, \varphi \rangle$ Where φ consists of the productions $S \rightarrow aSBC$, $S \rightarrow aBC$, $CB \rightarrow BC$, $aB \rightarrow ab$, $bB \rightarrow bb$, $bC \rightarrow bc$, $cC \rightarrow cc$.	10M	3	4
Q.5(A)	(i) Show that the lattice (S_n, D) for $n = 216$ is isomorphic to the direct product of lattices for $n = 8$ and $n = 27$, where D denotes the relation of "division".	10M	4	3

(ii) Let (S_n, D) and (S_n, \leq) be the given lattices, where D and \leq mean the relation of "division" and "less than equal to", respectively. Is (S_n, D) isomorphic to (S_n, \leq) for $n = 12$? Explain.

OR

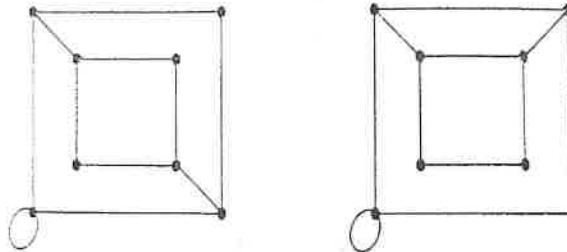
- Q.5(B) (i) In any Boolean algebra, show that $a = b \Leftrightarrow ab' + a'b = 0$ and $a = 0 \Leftrightarrow ab' + a'b = b$. 10M 4 3
 (ii) Use the Karnaugh map representation to find a minimal sum-of-product expression of $f(a, b, c, d) = \sum(5, 7, 10, 13, 15)$

- Q.6(A) Describe matrix representation of graphs with suitable example and obtain the adjacency matrix A of the following digraph and determine A' , $A'A$ and AA' . 10M 5 2



OR

- Q.6(B) Define isomorphism between graphs and explain their properties and verify that the following graphs are isomorphic. 10M 5 3



*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

JAVA PROGRAMMING
(Computer Science & Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Differentiate instance variable and static variable.	1M	1	3
	ii. List out the various types of data types supported in Java.	1M	1	1
	iii. Give the meaning of "public static void main(String[] args)"	1M	2	1
	iv. When can you use super keyword in Java?	1M	2	1
	v. List the states of a thread in Java	1M	3	1
	vi. Why synchronization is required in thread programs?	1M	3	1
	vii. Distinguish Priority Queue and Queue in Java.	1M	4	3
	viii. What is I/O Streams in Java?	1M	4	1
	ix. List the advantages of using MVC architecture.	1M	5	1
	x. List the various event handling methods available in Java.	1M	5	1
Q.2(A)	Explain the various control statements in Java with respective code snippet as example for each.	10M	1	4
OR				
Q.2(B)	What are the advantages of classes and objects? How can we access the object created in the Heap? Give details with example code.	10M	1	3
Q.3(A)	Explain the process of defining and creating a package with suitable examples.	10M	2	2
OR				
Q.3(B)	List and explain the various String handling methods in Java with suitable examples.	10M	2	3
Q.4(A)	Explain the Life Cycle of a Thread with an example program.	10M	3	4
OR				
Q.4(B)	What is an exception? Explain exception handling in Java with examples.	10M	3	2
Q.5(A)	Explain in detail about the Array list in Collections framework with suitable examples.	10M	4	3
OR				
Q.5(B)	Illustrate the Byte Stream Classes and Character Stream Classes.	10M	4	2
Q.6(A)	Discuss about the MVC Architecture in Java.	10M	5	4
OR				
Q.6(B)	Describe in details the JDBC Connectivity with an example program.	10M	5	3

*** END***

Hall Ticket No:

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Question Paper Code: 20CSE107

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

OPERATING SYSTEMS FUNDAMENTALS

(Computer Science & Engineering)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. What are the objectives of operating system?	1M	1	1
	ii. Define operating system.	1M	1	1
	iii. What is throughput?	1M	2	1
	iv. Define Process.	1M	2	1
	v. What are the conditions for the occurrence of deadlock?	1M	3	1
	vi. What is deadlock?	1M	3	1
	vii. Define compaction	1M	4	1
	viii. Define page fault	1M	4	1
	ix. Mention the drawbacks of contiguous allocation of disk space.	1M	5	1
	x. List the various file attributes	1M	5	1
Q.2(A)	Discuss in detail about different structures of a operating system.	10M	1	2
OR				
Q.2(B)	Outline about looping control structure in Korn Shell script with an example.	10M	1	2
Q.3(A)	Define process. Explain various steps involved in changes of a process state with process state neat transition diagram.	10M	2	2
OR				
Q.3(B)	Explain the concept of multi-threading? Discuss the following multithreading models. (a) Many-to-one (b) One-to-one (c) Many-to-many (d)One -to-Many	10M	2	2
Q.4(A)	Discuss on process synchronization. Illustrate Peterson's algorithm and Producer/Consumer problem of synchronization.	10M	3	2
OR				
Q.4(B)	Define deadlock. Explain Banker's algorithm with an example.	10M	3	2
Q.5(A)	Explain the following: (a) Paging (b) Page table structure	5M 5M	4	2
OR				
Q.5(B)	Explain Page replacement algorithms with an example.	10M	4	2
Q.6(A)	Explain the different types of file allocation methods with neat diagram. Mention the advantages and disadvantages of each file allocation methods.	10M	5	2
OR				
Q.6(B)	Explain C-SCAN and SCAN scheduling algorithms. Illustrate with examples	10M	5	2

*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

DESIGN AND ANALYSIS OF ALGORITHMS

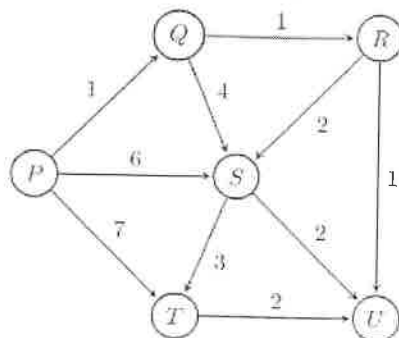
(Computer Science & Engineering)

Time: 3Hrs

Max Marks: 60

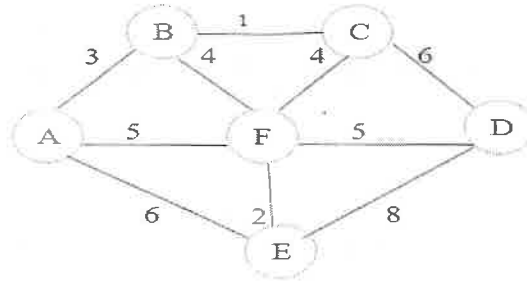
Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL																									
Q.1	i. State Master's theorem.	1M	1	1																									
	ii. What is the use of asymptotic notations?	1M	1	2																									
	iii. What are the differences between dynamic programming and divide and conquer approaches?	1M	2	2																									
	iv. What is constrained optimization problem?	1M	2	1																									
	v. State the applications of graph coloring problem.	1M	3	1																									
	vi. What is BFT and DFT?	1M	3	1																									
	vii. What is state space tree?	1M	4	1																									
	viii. Define the term "Branch and Bound".	1M	4	1																									
	ix. What is a P class problem?	1M	5	1																									
	x. When is a problem said to be NP hard?	1M	5	1																									
Q.2(A)	a)Devise an algorithm for binary search and calculate its time complexity .	10M	1	3																									
OR																													
Q.2(B)	Write an algorithm for merge sort and trace it for the following data: 41,79,65,35,21,48,59,87,52,28. Derive merge sort time complexity for worst case and best case.	10M	1	3																									
Q.3(A)	Discuss about String editing problem with an algorithm and find the minimum cost of edit operations that will transfer X=sunday into Y=saturday using dynamic programming strategy.	10M	2	3																									
OR																													
Q.3(B)	State the Travelling Sales Person Problem. Elaborate the steps in solving the Travelling Sales Person Problem using dynamic programming for the given adjacency matrix.	10M	2	3																									
<table style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td>a</td> <td>b</td> <td>c</td> <td>d</td> </tr> <tr> <td>a</td> <td>0</td> <td>2</td> <td>5</td> <td>7</td> </tr> <tr> <td>b</td> <td>2</td> <td>0</td> <td>8</td> <td>3</td> </tr> <tr> <td>c</td> <td>5</td> <td>8</td> <td>0</td> <td>1</td> </tr> <tr> <td>d</td> <td>7</td> <td>3</td> <td>1</td> <td>0</td> </tr> </table>						a	b	c	d	a	0	2	5	7	b	2	0	8	3	c	5	8	0	1	d	7	3	1	0
	a	b	c	d																									
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c	5	8	0	1																									
d	7	3	1	0																									
Q.4(A)	Perform Dijkstra's single source shortest path algorithm for the following graph where P is the source node.	10M	3	2																									



OR

Q.4(B) Give the pseudocode for Kruskal's algorithm and apply the same to find the minimum spanning tree of the graph shown below. 10M 3 3



Q.5(A) State the sum of subset problem. Solve the following sum of subset problem using the backtracking algorithm when $A=\{3, 5, 6, 7\}$ and $d=15$ 10M 4 3

OR

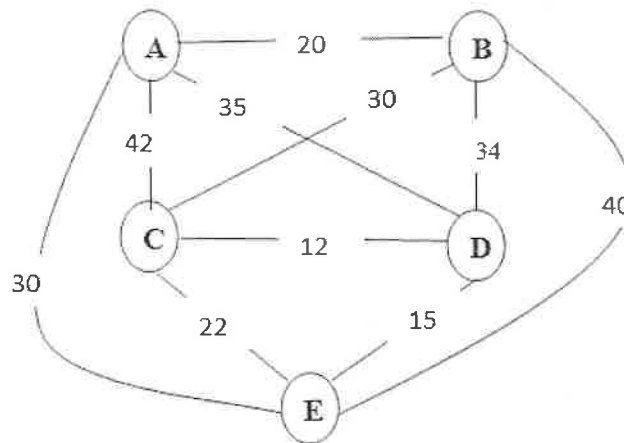
Q.5(B) Solve the following instance of Knapsack problem using Branch and Bound algorithm. 10M 4 3

ITEM	WEIGHT	PROFIT	M=15
1	2	3	
2	3	4	
3	4	5	
4	5	6	

Q.6(A) (i) Define P, NP class of problems with examples. Represent the two sets using a Venn diagram.
(ii) Define Satisfiability Problem.
(iii) What are NP hard class of problems? 10M 5 2

OR

Q.6(B) In the following TSP problem, the pairwise city distances satisfy the rule of the sides of a triangle. Give a polynomial approximation algorithm to solve the problem. Analyze the algorithm to ensure the value of k, of k-approximation, of your algorithm. 10M 5 2



*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations – May 2024

COMPUTER ARCHITECTURE

(CST)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Define Moore's law.	1M	1	1
	ii. List at least 5 applications of computers.	1M	1	1
	iii. Perform the 2's complement for the binary number 111001.	1M	2	3
	iv. Mention the three ways to represent signed numbers.	1M	2	2
	v. What is meant by pipelining? What are the different pipeline stages?	1M	3	1
	vi. What are the hazards? Write its types.	1M	3	1
	vii. List out the two main approaches to hardware multithreading.	1M	4	1
	viii. Define Static Multiple Issue.	1M	4	1
	ix. List the various memory mapping techniques.	1M	5	1
	x. List out the functions performed by an Input/Output unit.	1M	5	1
Q.2(A)	Explain in detail about the Functional Units of Computer system with diagram.	10M	1	2
OR				
Q.2(B)	Discuss about various types of MIPS Addressing modes with suitable diagrams.	10M	1	3
Q.3(A)	Explain the Booth's Multiplication Algorithm with the help of a flowchart. Multiply 11 x -11 using Booth's Multiplier.	10M	2	4
OR				
Q.3(B)	Draw the flowchart for the Restoring division algorithm and divide 23 by 2 in non-restoring methods.	10M	2	4
Q.4(A)	Explain the basic concepts of pipelining and compare it with sequence processing with a neat diagram.	10M	3	2
OR				
Q.4(B)	List the various pipeline hazards. Explain in detail	10M	3	2
Q.5(A)	Explain in detail Flynn's classification of parallel hardware.	10M	4	3
OR				
Q.5(B)	Explain in detail about hardware Multithreading.	10M	4	2
Q.6(A)	Consider a 2-way set associative mapped cache of size 16 KB with block size 256 bytes. The size of the main memory is 128 KB. Find and represent the Physics Address (P.A) bits Split up. Also, find the tag directory size.	10M	5	4
OR				
Q.6(B)	i) Draw the Memory hierarchy pyramid and explain briefly.	3M	5	2
	ii) Consider a direct mapped cache with a block size of 4 KB. The main memory size is 16 GB, with 10 bits in tag. Find a) Size of cache memory b) Tag directory size.	7M		4

*** END***

Hall Ticket No:

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Question Paper Code: 20CST106

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

OBJECT ORIENTED PROGRAMMING USING JAVA

(Computer Science & Technology)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. State the lifetime of variables.	1M	1	1
	ii. Define type conversion.	1M	1	1
	iii. What is inheritance ?	1M	2	1
	iv. Define Method Overriding.	1M	2	1
	v. Define Exception.	1M	3	1
	vi. What is Synchronization?	1M	3	1
	vii. Why file handling is required?	1M	4	2
	viii. Differentiate between character and byte stream.	1M	4	2
	ix. List out the user interface components.	1M	5	2
	x. Write the syntax of a function to create a button with string 'str' as a label.	1M	5	2
Q.2(A)	Suppose there are 25 students in the Production Engineering department of MIT. All students have its unique enrollment number, registration number, and name. Write a program to demonstrate the usage of 'static variables' by refers to the common property of all the objects	10M	1	3
OR				
Q.2(B)	Explain the features of Object-oriented Programming with example.	10M	1	3
Q.3(A)	Illustrate the process of various types of inheritances with examples and syntax.	10M	2	3
OR				
Q.3(B)	Write a Java program to create a Teacher class and derive Professor/ Associate_Professor/Assistant_Professor class from Teacher class. Define appropriate constructor for all the classes. Also define a method to display information of Teacher. Make necessary assumptions as required.	10M	2	3
Q.4(A)	Discuss about Usage of Try, Catch, Throw, Throws and Finally keywords with example..	10M	3	2
OR				
Q.4(B)	Explain in detail about inter thread communication system with the suitable example..	10M	3	2
Q.5(A)	Explain in detail about delegation event model.	10M	4	3
OR				
Q.5(B)	Demonstrate through a java program of how to create, read and write a file.	10M	4	3
Q.6(A)	Discuss in detail about how to work with frame, class, color and fonts with a case study.	10M	5	2
OR				
Q.6(B)	Draw AWT Hierarchy and discuss in detail about every module in the hierarchy with examples and syntax	10M	5	3

*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

OPERATING SYSTEMS
(Computer Science & Technology)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL																					
Q.1	i. Define Operating System.	1M	1	1																					
	ii. What is the purpose of system calls?	1M	1	1																					
	iii. Define starvation.	1M	2	1																					
	iv. Distinguish between counting and binary semaphores.	1M	2	2																					
	v. Compare preemptive and non-preemptive scheduling.	1M	3	2																					
	vi. Give the condition necessary for a deadlock situation to arise.	1M	3	1																					
	vii. List the differences between logical and physical addresses.	1M	4	2																					
	viii. What is Demand Paging?	1M	4	1																					
	ix. Define Seek Time and Latency Time.	1M	5	1																					
	x. Write various file accessing methods.	1M	5	1																					
Q.2(A)	Explain the operating system structure and its functions.	10M	1	2																					
OR																									
Q.2(B)	Discuss various types of system calls with examples.	10M	1	2																					
Q.3(A)	With a neat sketch, explain the process state diagram and PCB in details.	10M	2	2																					
OR																									
Q.3(B)	Illustrate any two classical synchronization in detail.	10M	2	2																					
Q.4(A)	Consider the following workload in a system:	10M	3	3																					
<table border="1" style="margin: auto;"><thead><tr><th>Process</th><th>Burst Time</th><th>Arrival Time</th></tr></thead><tbody><tr><td>P1</td><td>5</td><td>5</td></tr><tr><td>P2</td><td>6</td><td>4</td></tr><tr><td>P3</td><td>7</td><td>3</td></tr><tr><td>P4</td><td>9</td><td>1</td></tr><tr><td>P5</td><td>2</td><td>2</td></tr><tr><td>P6</td><td>3</td><td>6</td></tr></tbody></table>					Process	Burst Time	Arrival Time	P1	5	5	P2	6	4	P3	7	3	P4	9	1	P5	2	2	P6	3	6
Process	Burst Time	Arrival Time																							
P1	5	5																							
P2	6	4																							
P3	7	3																							
P4	9	1																							
P5	2	2																							
P6	3	6																							
Draw a Gantt chart illustrating the execution of these jobs using FCFS, SJF and Round robin scheduling algorithm with time quantum as 3 and also Calculate the average waiting time and average turnaround time.																									
OR																									
Q.4(B)	Explain Banker's deadlock-avoidance algorithm with an illustration.	10M	3	2																					
Q.5(A)	(i) Explain the concept of demand paging in detail with neat diagrams.	5M	4	2																					
	(ii) Consider the memory partition of 200 KB, 500 KB, 200 KB and 600 KB(in order). Show with a neat sketch how would each of the first-fit, best-fit and worst fit algorithms place processes of 512 KB,	5M	4	3																					

117 KB, 122 KB and 226 KB (in order).

OR

Q.5(B) Illustrate the FIFO, LRU and Optimal page-replacement algorithm using the reference string 7, 0,1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2,1, 2, 0, 1, 7, 0,1 for a memory with three frames. 10M 4 3

Q.6(A) Briefly, explain various disk-scheduling algorithms. 10M 5 2

OR

Q.6(B) Discuss in detail about the file allocation techniques: sequential, indexed and linked. 10M 5 2

***** END*****

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

NETWORK AND COMMUNICATION

(Computer Science & Technology)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Identify different Data representations in computer network?	1M	1	1
	ii. Define Protocol?	1M	1	1
	iii. What is meant by circuit switching?	1M	2	1
	iv. Memorize the importance of Bluetooth Low Energy?	1M	2	1
	v. Why do we go for IPv6 than IPv4?	1M	3	2
	vi. State Unicast routing?	1M	3	2
	vii. List classes of Networks.	1M	4	1
	viii. How Socket Connection is will be established?	1M	4	1
	ix. Discover Active Attacks and Passive Attacks?	1M	5	3
	x. What is the Cryptography?	1M	5	3
Q.2(A)	Discuss the seven different layers of OSI model with neat architecture?	10M	1	3
OR				
Q.2(B)	Briefly explain Error Detection and Error Correction with algorithms with examples?	10M	1	2
Q.3(A)	Explain briefly Ethernet and Bluetooth technologies?	10M	2	2
OR				
Q.3(B)	Explain briefly Message switching and Packet switching in detail?	10M	2	2
Q.4(A)	Give the Differences between Intradomain and Interdomain Routing with examples?	10M	3	3
OR				
Q.4(B)	Differentiate IPV4 and IPV6 with corresponding Header formats?	10M	3	3
Q.5(A)	Explain in detail about Flow, Error and Congestion control techniques?	10M	4	2
OR				
Q.5(B)	With neat architecture, discuss the state-of-art services and features of TCP protocol and UDP protocol?	10M	4	2
Q.6(A)	Briefly explain the network security, need to go for a firewall with its types and specifications?	10M	5	3
OR				
Q.6(B)	Write a short note on following protocols	10M	5	4
	i) DNS			
	ii) WWW			
	iii) HTTP			

*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)
B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024
OPERATING SYSTEMS FUNDAMENTALS
(CSE-Artificial Intelligence)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. List any four functions of operating system.	1M	1	1
	ii. Differentiate between kernel mode and user mode.	1M	1	2
	iii. What is a dispatcher process?	1M	2	1
	iv. Define context switching.	1M	2	1
	v. Compare the Safe and unsafe state.	1M	3	1
	vi. Define Semaphore.	1M	3	1
	vii. What is meant by page fault?	1M	4	1
	viii. What is thrashing?	1M	4	1
	ix. Difference between primary storage and secondary storage	1M	5	2
	x. What is meant by Disk scheduling?	1M	5	1

Q.2(A) Describe in detail about the OS system services and system calls. 10M 1 2

OR

Q.2(B) Explain the following in detail: 10M 1 2
(i) For loop (ii) While loop (iii) Do-while loop

Q.3(A) Define process. Explain various steps involved in change of a process state with neat process state transition diagram. 10M 2 2

OR

Q.3(B) Consider the set of 5 processes whose arrival time and burst time are given below: 10M 2 3

Process Id	Arrival time	Burst time
P1	0	4
P2	1	5
P3	2	2
P4	3	1
P5	4	6

If the CPU scheduling policy is FCFS, SJF and Round Robin with time quantum = 2, calculate the average waiting time and average turnaround time.

Q.4(A) Define critical section. Explain Peterson's solution in detail. 10M 3 2

OR

Q.4(B) Illustrate the use of the banker's algorithm, consider a system with five threads P0 through P4 and three resource types A, B, and C. Resource type A has ten instances, resource type B has five instances, and resource type C has seven instances. Suppose that the following snapshot represents the current state of the system: 10M 3 3

	<i>Allocation</i>	<i>Max</i>	<i>Available</i>
	<i>A B C</i>	<i>A B C</i>	<i>A B C</i>
<i>P0</i>	0 1 0	7 5 3	3 3 2
<i>P1</i>	2 0 0	3 2 2	
<i>P2</i>	3 0 2	9 0 2	
<i>P3</i>	2 1 1	2 2 2	
<i>P4</i>	0 0 2	4 3 3	

Answer the following questions using the banker's algorithm:

- What is the content of the matrix **Need**?
- Is the system in a safe state?
- If a request from thread *P1* arrives for (1,0,2), can the request be granted immediately?

Q.5(A)	What is virtual memory? Discuss the benefits of virtual memory techniques.	10M	4	2
OR				
Q.5(B)	Consider the following reference string: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1. Assume there are three frames. Apply Optimal and LRU replacement algorithm to the reference string above and find out how many page faults are produced.	10M	4	3
Q.6(A)	List out the different file allocation method. Mention its advantages and disadvantages.	10M	5	2
OR				
Q.6(B)	Consider a disk queue with requests for I/O to blocks on cylinders in the following order: 98, 183, 37, 122, 14, 124, 65, and 67. The disk head is initially at cylinder 53 and the cylinders are numbered from 0 to 199. Discuss how the following disk scheduling algorithm will work for the above data set. (i) First come first serve scheduling. (ii) Shortest seek time first scheduling. (iii) SCAN scheduling.	10M	5	3
*** END***				

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

AI TOOLS, TECHNIQUES AND APPLICATIONS

(CSE-Artificial Intelligence)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Explain Type I and Type II errors in classification problems	1M	1	2
	ii. Define Null hypothesis and Alternate hypothesis.	1M	1	2
	iii. Is SOM supervised classifier or unsupervised classifier?	1M	2	1
	iv. What is unsupervised Learning?	1M	2	2
	v. Illustrate the output of logistic regression?	1M	3	2
	vi. What does K stand for in KNN classifier?	1M	3	1
	vii. What is Inverse Document Frequency (IDF)?	1M	4	2
	viii. Define Binary frequency matrix.	1M	4	2
	ix. Name any one filter used in image processing.	1M	5	1
	x. Explain any two applications of CNN.	1M	5	2

Q.2(A) The management of Priority Health Club claims that its members lose an average of 10 pounds or more within the first month after joining the club. A consumer agency that wanted to check this claim took a random sample of 36 members of this health club and found that they lost an average of 9.2 pounds within the first month of membership. The population standard deviation is known to be 2.4 pounds. Find the p-value for this test. What will your decision be if $\alpha = .01$? What if $\alpha = .05$?

OR

Q.2(B) Describe Hypothesis testing and Explain Two tailed test in detail. 10M 1 2

Q.3(A) Explain reinforcement learning in detail along with the various elements involved in forming the concept. 10M 2 2

OR

Q.3(B) Cluster the following eight points (with (x, y) representing locations) into three clusters using K-means algorithm. 10M 3 3

A1(2, 10), A2(2, 5), A3(8, 4), A4(5, 8), A5(7, 5), A6(6, 4), A7(1, 2), A8(4, 9). Initial cluster centers are: A1(2, 10), A4(5, 8) and A7(1, 2)

Q.4(A) Construct a decision tree for the following data. 10M 3 3

Attribute1	Attribute2	Class label
T	T	+
T	T	+
T	F	-
F	F	+
F	T	-
F	T	-

OR

Q.4(B)	Develop ANN with 3 layers with bias and without bias. Calculate the output feedforward signal propagation. Input Layer --> x_0, x_1 are two nodes with values 5 and 4 Hidden Layer --> x_2, x_3 are two nodes with weights 1,2 and 3,4 Output Layer --> x_4 is output node with weight 2,1	10M	3	2
Q.5(A)	Document 1: The chocolate cake is delicious and moist. Document 2: A dog is a loyal companion, while a cat is independent. Document 3: I love wearing my cozy blue sweater and warm gray scarf. Document 4: She always carries a stylish handbag and wears trendy sunglasses. Document 5: The new phone features a sleek design and innovative technology. Apply text preprocessing on the above documents. OR	10	4	3
Q.5(B)	Define formal grammar? Explain different types of grammar according to Chomsky's hierarchy.	10M	4	2
Q.6(A)	What is Noise? List the various reason why noise can be incorporated into an image? Explain the filter used to get rid of noise. OR	10M	5	2
Q.6(B)	How can Convolution Neural Networks (CNNs) be effectively employed to classify the MNIST dataset, which consists of handwritten digit images, into their respective numerical categories? *** END***	10M	5	3

Hall Ticket No:

Question Paper Code: 20CAI109

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

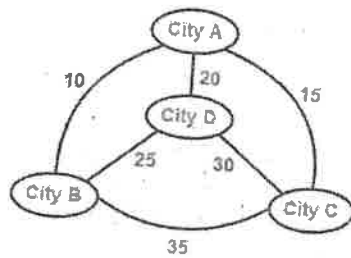
DESIGN AND ANALYSIS OF ALGORITHMS
(CSE-Artificial Intelligence)

Time: 3Hrs

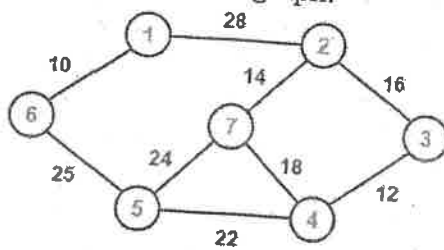
Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Define Algorithm?	1M	1	1
	ii. What is Time Complexity of Quicksort ?	1M	1	1
	iii. What is Fractional Knapsack problem?	1M	2	2
	iv. Explain about optimal solution.	1M	2	2
	v. What is the difference between prims and Kruskal algorithm?	1M	3	2
	vi. Define all pairs shortest path problem	1M	3	2
	vii. Write about Graph colouring Problem.	1M	4	1
	viii. Define Branch and Bound.	1M	4	1
	ix. Define NP Completeness and NP Hard.	1M	5	2
	x. What is approximation?	1M	5	2
Q.2(A)	Solve the below recurrence relations using master method: (i) $T(n) = 2 T(\frac{n}{2}) + n \log(n)$ (ii) $T(n) = 3 T(\frac{n}{3}) + \frac{n}{2}$	10M	1	3
OR				
Q.2(B)	Describe the binary search algorithm and its time complexity with an example.	10M	1	2
Q.3(A)	Define Greedy Method. Find the optimal solution of the Fractional Knapsack instance $n=7, M=15, (p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$	10M	2	3
OR				
Q.3(B)	Describe Travelling salesman problem and find the travelling salesman tour for the below graph using dynamic programming.	10M	2	3



Q.4(A) What is Minimum Spanning Tree? Use Prims algorithm to find the minimum spanning Tree of the given graph. 10M 3 3



OR

Q.4(B)	Discuss Dijkstra's single source shortest path algorithm with suitable example.	10M	3	3
Q.5(A)	What do you understand by backtracking? Explain the N-Queens problem with help of suitable example.	10M	4	3
OR				
Q.5(B)	Discuss Draw the portion of state space tree generated by LCBB for the following instance of 0/1 knapsack $n=5$, $M=12$, $(p_1, \dots, p_5) = (10, 15, 6, 8, 4)$ $(w_1, \dots, w_5) = (4, 6, 3, 4, 2)$	10M	4	3
OR				
Q.6(A)	(i) Write and explain the Cook's theorem.	5M	5	2
	(ii) Explain Satisfiability problem.	5M	5	2
OR				
Q.6(B)	Discuss in detail about the class P, NP, NP-hard and NP-complete problems. Give examples for each class.	10M	5	2
*** END***				

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

OPERATING SYSTEMS FUNDAMENTALS

(CSE-Data Science)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Define Multi-tasking	1M	1	1
	ii. What are the Special Parameters and Variables?	1M	1	1
	iii. Distinguish between user thread and kernel thread.	1M	2	2
	iv. State Critical section problem.	1M	2	1
	v. Describe about race condition	1M	3	1
	vi. List the Deadlock Characteristics.	1M	3	2
	vii. What is the difference between internal and external fragmentation	1M	4	1
	viii. What is the difference between page and frame?	1M	4	1
	ix. List the file allocation methods.	1M	5	1
	x. Define SCAN.	1M	5	1
Q.2(A)	Discuss in detail about different structure of Operating System.	10M	1	2
OR				
Q.2(B)	Illustrate the looping statements available in shell programming with an example.	10M	1	3
Q.3(A)	i) Define Process. Explain different states of Process with neat diagram	5M	2	2
	ii) Explain about types of scheduling algorithm with advantages and disadvantages?	5M	2	2
OR				
Q.3(B)	Consider the following five processes with the length of the CPU burst time in milliseconds. Process : P1 P2 P3 P4 P5 Burst Time : 10 1 2 1 5 Priority : 3 1 3 4 2 Processes are assumed to have arrived at time 0. For the above set of processes find the average waiting time and average turnaround time for each of the following scheduling algorithm using Gantt chart. Consider 1 is highest priority: using SJF.	10M	2	3
Q.4(A)	Discuss about Producer/Consumer problem and Dining Philosopher problem.	10M	3	2
OR				
Q.4(B)	What is dead lock? Explain about the dead lock prevention conditions. Explain about deadlock detection.	10M	3	2
Q.5(A)	Solve the Problem and find number of page faults in least recently used page replacement using reference 7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1. Assume the number of frames as 3.	10M	4	3

OR

Q.5(B)	i) Write about performance of demand paging.	5M	4	2
	ii) Write about page fault, dirty page ?	5M		2
Q.6(A)	List various file allocation methods and discuss any two in detail.	10M	5	2
OR				
Q.6(B)	Illustrate SCAN & C-SCAN scheduling by using queue 98, 183, 37,122,14,124,65,67. Head start at 53 and find the head movement to reduce number of cylinders.	10M	5	3

***** END*****

Hall Ticket No:

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Question Paper Code: 20CSD108

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

PYTHON FOR DATA SCIENCE

(CSE-Data Science)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. Outline the difference between data cleansing and data transformation.	1M	1	2
	ii. List out any three real world examples of data management.	1M	1	1
	iii. How does divmod universal function works in ndarray.	1M	2	2
	iv. Write the source code to create a Numpy ndarray object from a tuple.	1M	2	3
	v. Write the syntax to create a Series Data structure. Create a series data structure from a ndarray	1M	3	3
	vi. Mention the different types of sorting in Pandas.	1M	3	1
	vii. Name the package used to plot in pandas. Write it's syntax	1M	4	3
	viii. Define outlier.	1M	4	1
	ix. Compare and Contrast True Positives and False Positives.	1M	5	2
	x. How come training set is different from thetesting set?	1M	5	1
Q.2(A)	Explain briefly on lifecycle of data science.	10M	1	2
	OR			
Q.2(B)	Discuss in detail on data cleaning.	10M	1	4
Q.3(A)	i) Explain any five universal functions used for simple arithmetic with example.	5M	2	2
	ii.) Explain all the five ways of rounding off decimals in NumPy with examples.	5M		
	OR			
Q.3(B)	i.)How would you use slicing and negative slicing.	5M	2	2
	ii.) With examples show how slicing works on 1D and 2D arrays.	5M		
Q.4(A)	i) Explain any five basic functionalities on Series data structure with source code.	5M	3	2
	ii) Summarize any five basic functionalities of dataframe with source code.	5M		
	OR			
Q.4(B)	i) Write note on indexing and selection of data in pandas with example source code.	5M	3	3
	ii) Write note on reindexing of data in pandas with example source code	5M		
Q.5(A)	What type of the methods that are used for handling Missing Data in Pandas?	10M	4	2
	OR			
Q.5(B)	Mention any 10 vectorized string functions and illustrate it's properties with source code.	10M	4	3
Q.6(A)	Discuss in detail about Naïve Bayes Classifier with its types and applications.	10M	5	4
	OR			
Q.6(B)	Define linear regression. Compare and Contrast Linear and Logistic regression.	10M	5	2

*** END***

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

DESIGN AND ANALYSIS OF ALGORITHMS

(CSE-Data Science)

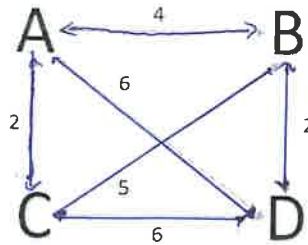
Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.

All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

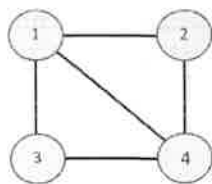
Q.No	Question	Marks	CO	BL
Q.1	i. What is Binary search?	1M	1	1
	ii. Show the number of iterations required to sort the array 10, 23, 14, 35, 17, 15, 16 by using Merge sort.	1M	1	2
	iii. Which strategy is used in job sequencing with deadlines? State the time complexity.	1M	2	1
	iv. State the String Editing problem. How can it be solved efficiently?	1M	2	2
	v. What is minimum spanning tree?	1M	3	2
	vi. Annotate Direct Acyclic Graph. Give an example.	1M	3	2
	vii. When can a node be terminated in the subset-sum problem?	1M	4	2
	viii. Define Branch and Bound.	1M	4	2
	ix. Define deterministic algorithm.	1M	5	3
	x. When a problem is said to be NP Hard?	1M	5	2
Q.2(A)	Explain the various asymptotic notations used to represent the time complexity. Give example for each.	10M	1	2
OR				
Q.2(B)	Write the binary search algorithm and analyze its time complexity with an example.	10M	1	4
Q.3(A)	(i) Explain the methodology of Dynamic programming.	5M	2	3
	(ii) Let str1 = "INTENTION" and str2 = "EXECUTION", apply the string editing algorithm for transforming str1 into str2.	5M		
OR				
Q.3(B)	Describe Travelling salesman problem. Apply dynamic programming to solve the following travelling salesman tour.	10M	2	3



Q.4(A)	Explain how solution will be provided for all pairs shortest path problem using dynamic programming with an example.	10M	3	2
OR				
Q.4(B)	Consider the following matrix and find the shortest path distance between every pair of vertices Using Floyd Warshall's algorithm.	10M	3	3

$$A^0 = \begin{matrix} & \begin{matrix} 1 & 2 & 3 & 4 \end{matrix} \\ \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \end{matrix} & \begin{bmatrix} 0 & 3 & \infty & 5 \\ 2 & 0 & \infty & 4 \\ \infty & 1 & 0 & \infty \\ \infty & \infty & 2 & 0 \end{bmatrix} \end{matrix}$$

Q.5(A) Color the below given graph with 3 colors using Backtracking algorithm 10M 4 3



OR

Q.5(B) Draw the portion of the state space tree generated by LC branch and bound for the given knapsack problem: $n=4$, $(P_1, P_2, P_3, P_4) = (10, 10, 12, 18)$, $(W_1, W_2, W_3, W_4) = (2, 4, 6, 9)$, and $m = 15$. 10M 4 3

Q.6(A) Discuss in detail about the class P, NP, NP-hard and NP-complete problems. Give examples for each class. 10M 5 2

OR

Q.6(B) (i) Explain vertex cover problem with example. 5M 5 2
(ii) Explain polynomial reduction problem. 5M

***** END*****

Hall Ticket No:

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Question Paper Code: 20CSC108

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

JAVA PROGRAMMING

(CSE-Cyber Security)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL
Q.1	i. List the features of Java.	1M	1	1
	ii. List out the various types of data types supported in Java.	1M	1	1
	iii. State about final and static keywords in java.	1M	2	1
	iv. Define method overriding.	1M	2	1
	v. Write about Exception.	1M	3	1
	vi. Define thread in java.	1M	3	1
	vii. State about stream in java.	1M	4	1
	viii. What is collection in java.	1M	4	1
	ix. Is AWT still used in Java? Write True or False.	1M	5	1
	x. Define event handling.	1M	5	1
Q.2(A)	(i) What is meant by byte code? Briefly explain how Java is platform independent.	5M	1	2
	(ii) Explain different parts of a Java program with an appropriate example.	5M	1	3
OR				
Q.2(B)	What is constructor write the types of constructors with example?	10M	1	2
Q.3(A)	What is string in java? How the strings are allocated in Java with suitable examples?	10M	2	3
	OR			
Q.3(B)	Write notes on following in detail: (i) Interfaces (ii) Packages (iii) Final	10M	2	2
Q.4(A)	Discuss in detail about the various types of exception handling mechanism supported by Java.	10M	3	3
OR				
Q.4(B)	Explain the way of creating a thread in Java by using Thread Class.	10M	3	2
Q.5(A)	Describe about I/O Streams in detail with appropriate example.	10M	4	2
OR				
Q.5(B)	What is Java collection framework explain with example.	10M	4	2
Q.6(A)	Discuss various AWT containers with examples	10M	5	2
OR				
Q.6(B)	Discuss the various layout managers used in Java?	10M	5	3

***** END*****

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

OPERATING SYSTEM FUNDAMENTALS FOR SECURITY

(CSE-Cyber Security)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL																		
Q.1	i. Write the different state of the process.	1M	1	1																		
	ii. What is an Operating System?	1M	1	1																		
	iii. What is Critical Section?	1M	2	1																		
	iv. What is Mutual exclusion?	1M	2	1																		
	v. Define demand paging in memory management.	1M	3	1																		
	vi. Define page fault.	1M	3	1																		
	vii. List the Security Goals.	1M	4	1																		
	viii. List out some the information flow models for both confidentiality and integrity.	1M	4	2																		
	ix. What are the different OS issues related to internet?	1M	5	1																		
	x. What do you meant by trusted OS?	1M	5	1																		
Q.2(A)	Explain Round Robin scheduling algorithm and demonstrate its performance for the following workload in a system with time quantum 2 units. Consider the set of 5 processes whose arrival time and burst time are given below. <table style="margin-left: 40px; border-collapse: collapse;"><thead><tr><th>Process</th><th>Arrival time</th><th>Burst time</th></tr></thead><tbody><tr><td>P1</td><td>0</td><td>5</td></tr><tr><td>P2</td><td>1</td><td>3</td></tr><tr><td>P3</td><td>2</td><td>1</td></tr><tr><td>P4</td><td>3</td><td>2</td></tr><tr><td>P5</td><td>4</td><td>3</td></tr></tbody></table> Draw a Gantt Chart illustrating the execution of these jobs and calculate the average waiting time and turnaround times	Process	Arrival time	Burst time	P1	0	5	P2	1	3	P3	2	1	P4	3	2	P5	4	3	10M	1	4
Process	Arrival time	Burst time																				
P1	0	5																				
P2	1	3																				
P3	2	1																				
P4	3	2																				
P5	4	3																				
Q.2(B)	What are the operating system Services? Explain in detail about any five of them.	10M	1	3																		
Q.3(A)	List and explain the different methods used for handling deadlocks.	10M	2	2																		
Q.3(B)	What is Semaphore? Give the implementation of Bounded Buffer Producer Consumer Problem using Semaphore	10M	2	4																		
Q.4(A)	What is thrashing? What is the cause of Thrashing? How does the system detect Thrashing? What can the system do to eliminate this problem.	10M	3	3																		
Q.4(B)	Explain about segmentation and illustrate the translation of logical address into physical address by segment table.	10M	3	2																		
Q.5(A)	Define threat. Explain the significance of creating threat model in system	10M	4	3																		

Q.5(B)	Discuss in detail about Mandatory Protection Systems with neat architecture	10M	4	2
Q.6(A)	Explain the Mobile Systems and Wireless Networks	10M	5	4
OR				
Q.6(B)	Discuss the security issues and attacks on different types of operating systems	10M	5	3

***** END*****

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE
(UGC-AUTONOMOUS)

B.Tech II Year II Semester (R20) Regular & Supplementary End Semester Examinations, May- 2024

DESIGN AND ANALYSIS OF ALGORITHMS

(CSE-Cyber Security)

Time: 3Hrs

Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
All parts of Q.no 1 are compulsory. In Q.no 2 to 6 answer either A or B only

Q.No	Question	Marks	CO	BL																								
Q.1	i. Define recursive relation	1M	1	1																								
	ii. Infer time complexity and space complexity.	1M	1	2																								
	iii. State Knapsack problem.	1M	2	2																								
	iv. Give the general principle of greedy method.	1M	2	2																								
	v. Compare Breadth First Search and Depth First Search.	1M	3	2																								
	vi. Interpret state space tree.	1M	3	2																								
	vii. List the advantage of graph coloring problem.	1M	4	1																								
	viii. What is Traveling salesman problem?	1M	4	1																								
	ix. Differentiate NP hard and NP Complete problem.	1M	5	2																								
	x. State Cooks theorem.	1M	5	2																								
Q.2(A)	Describe the binary search algorithm and write its worst case, best case and average case analysis.	10M	1	2																								
OR																												
Q.2(B)	Define Quick sort and write down the Pseudocode with an example.	10M	1	2																								
Q.3(A)	Solve the following job scheduling problem by using the greedy algorithm and find the optimal scheduling order.	10M	2	3																								
	<table border="1" style="margin-left: auto; margin-right: auto;"><thead><tr><th>Jobs</th><th>J1</th><th>J2</th><th>J3</th><th>J4</th><th>J5</th><th>J6</th><th>J7</th></tr></thead><tbody><tr><td>profits</td><td>35</td><td>30</td><td>25</td><td>20</td><td>15</td><td>12</td><td>5</td></tr><tr><td>deadlines</td><td>3</td><td>4</td><td>4</td><td>2</td><td>3</td><td>1</td><td>2</td></tr></tbody></table>	Jobs	J1	J2	J3	J4	J5	J6	J7	profits	35	30	25	20	15	12	5	deadlines	3	4	4	2	3	1	2			
Jobs	J1	J2	J3	J4	J5	J6	J7																					
profits	35	30	25	20	15	12	5																					
deadlines	3	4	4	2	3	1	2																					
OR																												
Q.3(B)	State the Greedy Knapsack. Find an optimal solution to the knapsack instance with $n=7, m=15, (p_1, p_2, p_3, p_4, p_5, p_6, p_7)=(10, 5, 15, 7, 6, 18, 3)$ and $(w_1, w_2, w_3, w_4, w_5, w_6, w_7)=(2, 3, 5, 7, 1, 4, 1)$	10M	2	3																								
Q.4(A)	Utilize Prim's algorithm for minimal spanning tree with an example	10M	3	3																								
OR																												
Q.4(B)	Apply Floyd's Algorithm for all pair shortest path algorithm with example and write its efficiency	10M	3	3																								
Q.5(A)	Solve LC branch and bound for $n=4, (P_1, P_2, P_3, P_4)=(10, 10, 12, 18), (W_1, W_2, W_3, W_4) = (2, 4, 6, 9)$, and $m = 15$ and Draw the portion of the state space tree.	10M	4	3																								
OR																												
Q.5(B)	Define sum of subsets problem. Find all sum of subsets for $n=5, s=\{1, 2, 5, 6, 8\}$ and $Sum=09$. Draw the portion of the state space tree.	10M	4	3																								
Q.6(A)	Compare and contrast of class P, NP, NP-hard and NP-complete problems.	10M	5	2																								
OR																												
Q.6(B)	What is complexity classes and explain in detail about types of complexity classes.	10M	5	2																								

*** END***