Hall Ticket No: | | | | | | | | | | | Course Code: 18SEP103

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

M.Tech I Year II Semester (R18) Regular End Semester Examinations –JUNE 2019

FINITE ELEMENT METHOD

(Structural Engineering)

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.no 1 to 5 answer either Part A or Part B only.

Q.1(A) Write short notes on:

i. Advantages and Disadvantages of Finite element methods. 6M
ii. Plane stress and Plane strain. 3M
iii. Principle of minimum potential energy. 3M

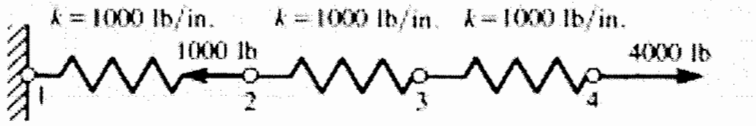
OR

Q.1(B) Explain in detail the various steps of finite element analysis. 12M

Q.2(A) Derive the shape function and stiffness matrix of a four noded two dimensional bar element. 12M

OR

Q.2(B) For the spring assemblages shown in figure below, determine the nodal displacements,the forces in each element, and the reactions. 12M



Q.3(A) i. Write short note on characteristics of shape function. 3M
ii. Derive the shape function and stiffness matrix of a six noded triangular element. 9M

OR

Q.3(B) Evaluate the integrals

a) $I = \int_{-1}^{1}(x^2 + \cos\left(\frac{x}{2}\right))\,dx$

b) $I = \int_{-1}^{1}(3^x - x)\,dx$ 12M

Using three-point Gaussian quadrature. Compute the error if any with the exact value.

Number of Points	Locations, x_i	Associated Weights, W_i
1	$x_1 = 0.000\ldots$	2.000
2	$x_1, x_2 = \pm 0.57735026918962$	1.000
3	$x_1, x_3 = \pm 0.77459666924148$	$\frac{5}{9} = 0.555\ldots$
	$x_2 = 0.000\ldots$	$\frac{8}{9} = 0.888\ldots$
4	$x_1, x_4 = \pm 0.8611363116$	0.3478548451
	$x_2, x_3 = \pm 0.3399810436$	0.6521451549

Q.4(A) The beam element having two nodes at the ends has y-direction displacement and rotation as the degrees of freedom at each node and thus it has four degrees of freedom in total. Derive the shape functions and the element stiffness matrix for the same. 12M

OR

Q.4(B) Write short notes on:

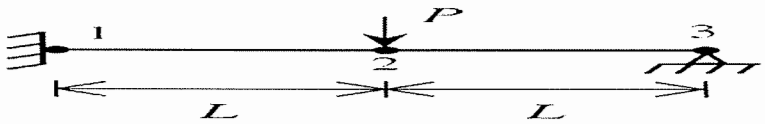
i. Global stiffness matrix. 4M

ii. Element stiffness matrix. 4M

iii. Global & local Coordinates. 4M

Q.5(A) Consider the beam shown in the figure below. Given E = 200GPa, I = 60×10^{-6} m^4, P = 30kN, and L = 3m, determine: 12M

a) the global stiffness matrix for the structure.
b) the vertical displacement at node 2.
c) the rotations at nodes 2 and 3.
d) the reactions at nodes 1 and 3.



OR

Q.5(B) Derive the shape functions, the strain displacement matrix and the element stiffness matrix for a 3D tetrahedral element. 12M

END

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MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

M.Tech I Year II Semester (R18) Regular End Semester Examinations – JUNE 2019

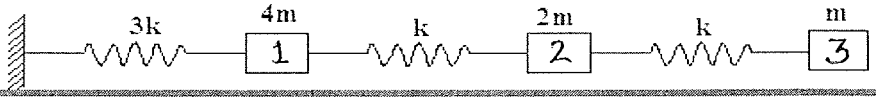
STRUCTURAL DYNAMICS

(Civil- Structural Engineering)

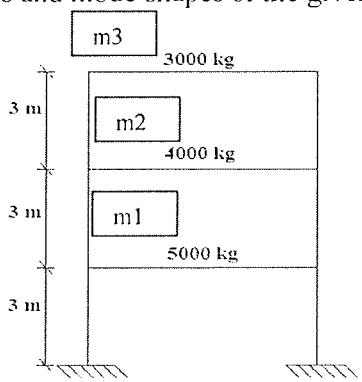
Time: 3Hrs Max Marks: 60

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.no 1 to 5 answer either Part A or Part B only.

Q.1(A)	Derive equation for free vibration response of SDOF system for un-damped conditions.	12M
	OR	
Q.1(B)	What is damping factor? Obtain the solution of equation of motion for free vibration of Critically damped and Over damped SDOF system.	12M
Q.2(A)	Derive equation for free vibration response of MDOF system for damped and un-damped condition.	12M
	OR	
Q.2(B)	Find the natural frequencies and mode shapes for the given system.	12M



Q.3(A)	Derive the responses of free damped multi degree freedom system by mode super position technique.	12M
	OR	
Q.3(B)	Determine the natural frequencies and mode shapes of the given MDOF system. EI = 4.5 x 10^6 N-m^2 for all columns.	12M



Q.4(A)	Explain about the equation of motion for single degree of freedom subjected to earthquake response acceleration $\ddot{x}(t)$.	12M
	OR	
Q.4(B)	Discuss I.S code methods of analysis.	12M
Q.5(A)	Explain Rayleigh's methods for extraction of eigen values.	12M
	OR	
Q.5(B)	Derive the natural frequency and mode shapes for the free flexural vibration of cantilever beam	12M

END

Hall Ticket No: | | | | | | | | | | | Course Code: 18SEP409

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

M.Tech I Year II Semester (R18) Regular End Semester Examinations – JUNE 2019

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Structural Engineering)

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.no 1 to 5 answer either Part A or Part B only.

Q.1(A) What are earthquakes. Explain the different causes of earthquakes 12M

OR

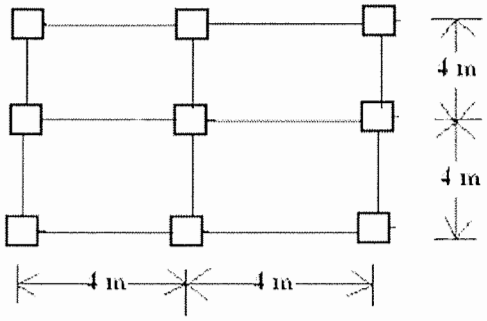
Q.1(B) Explain the Richter scale for measuring earthquakes and its advantages and disadvantages. 12M

Q.2(A) Derive equation for free vibration response of SDOF system for critically damped conditions. 12M

OR

Q.2(B) A Vibrating system consisting of a weight 50 N and a spring with stiffness of 4 N/mm is viscously damped. The ration of two successive amplitudes is 1: 0.85. Compute natural frequency of un-damped system, logarithmic decrement damping ratio, damping coefficient and damped natural frequency. 12M

Q.3(A) For a three storey SMRF building located in zone III, the dynamic properties (natural periods, and mode shapes) for vibration in the X-direction have been obtained by carrying out a free vibration analysis (as shown below). Obtain the lateral forces at different storey level by the dynamic analysis method. Consider the effect of at least first two modes. Assume Soil type: Hard Soil. 12M



OR

Q.3(B) Write short notes on 12M

a. Over turning moment
b. Twisting moment
c. soil structure Interaction
d. Seismic - zoning map.

Q.4(A) For a three storey SMRF building located in zone III, the dynamic properties (natural periods, and mode shapes) for vibration in the X-direction have been obtained by carrying out a free vibration analysis (as shown below). Obtain the lateral forces at different storey level by the dynamic analysis method. Consider the effect of at least first two modes. Assume Soil type: Hard Soil 12M

Free Vibration Properties of the building for vibration in the X-Direction

Natural Period (sec)	Mode 1	Mode 2	Mode 3
	0.860	0.265	0.145
	Mode Shape		
Roof	1.000	1.000	1.000
3rd Floor	0.904	0.216	-0.831
2nd Floor	0.716	-0.701	-0.574
1st Floor	0.441	-0.921	1.016

OR

Q.4(B) Design a shear wall of length 4.16 m and thickness 250 mm subjected to the following forces. 12M

Load Case	Axial Load (kN)	Moment (kNm)	Shear force (kN)
DL + LL	1950	600	20
Seismic Load	250	4800	700

Use M25 grade of concrete and Fe 415 steel.

Q.5(A) Write a note on selection of materials for seismic resistant design. 12M

OR

Q.5(B) Draw the ductile detailing provisions of a beams, columns and footing in reinforced concrete buildings. 12M

*****END*****

Hall Ticket No: | | | | | | | | | | | Course Code: 18SEP413

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

M.Tech I Year II Semester (R18) Regular End Semester Examinations – JUNE 2019

DESIGN OF HIGH RISE STRUCTURES

Time: 3Hrs **Max Marks: 60**

Attempt all the questions. All parts of the question must be answered in one place only.
In Q.no 1 to 5 answer either Part A or Part B only.

Q.1(A)	Write short notes on the following: a) Design philosophy of tall buildings b) History of tall buildings b) Vertical city concepts	12M
	OR	
Q.1(B)	Explain in detail the different foundation systems that are used in tall buildings.	12M
Q.2(A)	Write short notes on the following: a) Live load reduction b) Modal analysis c) Impact and construction loads	12M
	OR	
Q.2(B)	Write short notes on the following: a) High strength concrete b) Light weight concrete b) Fiber reinforced concrete composite materials	12M
Q.3(A)	Differentiate between the following types of two-way slab floor systems based on R.C.C a) Two-way flat plate b) Two-way flat slab c) Waffle slab system d) Two-way slab & beam system	12M
	OR	
Q.3(B)	Write short notes on the following types of one-way floor systems based on R.C.C a) One-way slab on beam or walls b) One-way pan joists and beams c) One way slab on beams and girders	12M
Q.4(A)	Explain atleast one of the simplifying assumption related to the modeling aspect of the following a) Materials b) Participating components c) Floor slabs d) Negligible stiffness e) Negligible deformations f) Cracking	12M
	OR	
Q.4(B)	i. Write a note on overall buckling analysis of frames and approximate methods to carryout the same with reference to the following modes: a) Shear mode b) Flexural mode c) Combined mode	6M
	OR	
	ii. Write an elaborate note on P-Δ analysis.	6M
Q.5(A)	Write an elaborate note on various steps involved in analysis and design of a high-rise structure using commercial software starting from modeling stage.	12M
	OR	
Q.5(B)	Write an elaborate note on analysis and design of chimneys with differences between steel chimney and RCC chimney.	12M

END