Hall Ticket No: | | | | | | | | | | | Course Code: 18MBAP114

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

(UGC-AUTONOMOUS)

MBA II Year I Semester (R18) Supplementary End Semester Examinations, July - 2023

OPERATIONS RESEARCH

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.no 6 which is a case study is compulsory.

S.No.	Question	Marks
Q.1(A)	A factory manufactures two products A and B on three machines X, Y, and Z. Product A requires 10 hours of machine X and 5 hours of machine Y a one our of machine Z. The requirement of product B is 6 hours, 10 hours and 2 hours of machine X, Y and Z respectively. The profit contribution of products A and B are Rs. 23/– per unit and Rs. 32 /– per unit respectively. In the coming planning period the available capacity of machines X, Y and Z are 2500 hours, 2000 hours and 500 hours respectively. Find the optimal product mix for maximizing the profit.	10M
	OR	
Q.1(B)	"Operations Research is a bunch of Mathematical Techniques" Comment	10M
Q.2(A)	Determine the optimum transportation cost for the following Transportation problem:	10M

	D1	D2	D3	D4	Availability
P1	20	22	17	4	120
P2	24	37	9	7	70
P3	32	37	20	15	50
Requirement	60	40	30	110	

OR

Q.2(B)	Is traveling salesman problem is an assignment problem? If yes how? If not what are the differences between assignment problem and traveling salesman problem.	10M
Q.3(A)	Write a short notes on: I) Saddle Point ii) Rule of Dominance iii) Pure Strategies	10M
	OR	
Q.3(B)	Solve the given game by method of oddments:	10M

		Player A		
		I	II	III
Player B	I	3	-1	-3
	II	-3	3	-1
	III	-4	-3	3

Q.4(A)	Dr Strong is dentist who schedules all per patients for 30 minutes appointments. Some of the patients take more or less than 30 minutes depending in the type of dental work to be done. The following summary shows the various categories of work, their probabilities and the time actually needed to complete the work..	10M

Categories	Filling	Crown	Clearing	Extraction	Checkup
Time Required (Min)	45	60	15	45	15
Prob of Category	0.40	0.15	0.15	0.10	0.20

Simulate the dentists clinic for four hours and determine the average waiting time for the patients as the illness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8.00 am. Use the following random numbers for handling the above problem: 40, 82, 11, 34, 25, 66, 17, 79.

OR

Q.4(B) The initial cost of a machine is Rs. 6100/- and its scrap value is Rs.100/-. The maintenance costs found from experience are as follows: 10M

Year	1	2	3	4	5	6	7	8
Annual Maintenance Cost in Rs	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

Q.5(A) A project consists of 4 activities. Their logical relationship and time taken is given along with crash time and cost details. If the indirect cost is Rs. 2000/- per week, find the optimal duration and optimal cost. 10M

Jobs	Predecessors	Normal		Crash	
		Time in Hrs	Cost in Rs/-	Time in Hrs	Cost in Rs/-
A	-	4	4000	2	12000
B	A	5	3000	2	7500
C	A	7	3600	5	6000
D	B	4	5000	2	10000

OR

Q.5(B) A product manufacturing plant at a city distributes its products by trucks, loaded at the factory warehouse. It has its own fleet of trucks plus trucks of a private transport company. This transport company has complained that sometimes its trucks have to wait in line and thus the company loses money paid for a truck and driver of waiting truck. The company has asked the plant manager either to go in for a second warehouse or discount prices equivalent to the waiting time. The data available is: 10M

Average arrival rate of all trucks = 3 per hour.

Average service rate is = 4 per hour.

The transport company has provided 40% of the total number of trucks. Assuming that these rates are random according to Poisson distribution, determine:

(*a*) The probability that a truck has to wait?

(*b*) The waiting time of a truck that has to wait,

(*c*) The expected waiting time of company trucks per day.

Q.6 **CASE STUDY** 10M

A small city of 15,000 people requires an average of 3 lakhs of gallons of water daily. The city is supplied with water purified at a central water works, where water is purified by filtration, chlorination and addition of two chemicals softening chemical X and health chemical Y. Water works plans to purchase two popular brands of products, product A and product B, which contain these two elements. One unit of product A gives 8 Kg of X and 3 Kg of Y. One unit of product B gives 4 Kg of X and 9 Kg of Y. To maintain the water at a minimum level of softness and meet a minimum in health protection, it is decided that 150 Kg and 100 Kg of two chemicals that make up each product must be added daily. At a cost of Rs. 8/– and Rs. 10/– per unit respectively for A and B, what is the optimum quantity of each product that should be used to meet consumer standard.