Code No: 57022 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, February/March - 2016

OPERATIONS RESEARCH

(Common to ME, MCT, AME, MSNT)

Time: 3 Hours **Max. Marks: 75**

Answer any Five Questions

All Questions Carry Equal Marks

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1.a) How do you identify the following solution in graphical methods?
i) Infeasible solution
ii) Unbounded solution

b) A company wants to purchase at most 180 units of a product. There are two types of the product, M_1 and M_2 available. M_1 occupies 2 ft^3, cost Rs. 12/- and the company makes a profit of Rs. 3/-. M_2 occupies 3ft^3, costs Rs. 15/- and the company makes a profit of Rs 4/- If the budget is Rs. 15,000/- and the warehouse has 3000 ft^3 for product. Formulate the problem as a linear programming model and solve the problem using simplex method. [5+10]

2. A trip from Hyderabad to Warangal takes 6 hours by bus. A typical time table of bus services in both directions is given below:

Hyderabad – Warangal			Warangal– Hyderabad		
Route No:	Departure	Arrival	Route No:	Departure	Arrival
a	06:00	12:00	1	05:30	11:30
b	07:30	13:30	2	09:00	15:00
c	11:30	17:30	3	15:00	21:00
d	19:00	01:00	4	18:30	00:30
e	00:30	06:30	5	00:00	06:00

The cost of providing this service by the transport company depends upon the time spent by the bus crew (driver and conductor) away from their places in addition to service times. There are five crews. There is a constraint that every crew should be provided with 4 hours of rest before return trip again and should not wait for more than 24 hours for the return trip. The company has residential facilities for the crew at Hyderabad as well as at Warangal. Obtain the pairing of routes so as to minimize the cost. [15]

3.a) Explain the algorithm for sequencing of 2 jobs to process on 'n' machines.

b) The following mortality rates have been found for a certain type of coal cutter motor:

Weeks	10	20	30	40	50
Total %failure up to end of 10	5	15	35	65	100

If the motors are replaced over the week, the total cost is Rs. 200. If they fail during the week the total cost is Rs. 100 per failure. Is it better to replace the motors before failure and if so when. [5+10]

4.a) Distinguish between the games with saddle points and without saddle points.

b) Solve the following game graphically. [5+10]

		Player B	
		5	-3
		3	5
Player A		-1	6
		4	1
		2	2
		-5	0

5. In machine maintenance a mechanic repairs four machines. The mean time between service requirements is 5 hours for each machine and forms an exponential distribution. The mean repair machine down time costs Rs. 25 per hour and the machine costs Rs. 55 per day of 8 hours.

a) Find the expected number of operating machines.

b) Determine the expected down time cost per day.

c) Would it be economical to engage two machines each repairing only two machines. [15]

6. The production department for a company requires 3600 kg of raw materials for manufacturing a particular item per year. It has been estimated that the cost of placing an order is Rs. 36 and the cost of carrying inventory is 25% of investment an the inventories. The price is Rs. 10 per kg. The purchase manager wishes to determine the operating doctrine for raw materials. [15]

7.a) Define Bellman's principle of optimality and its application to DPP.

b) Use dynamic programming to

Max $Z = 2x_1+3x_2$

Subject to constraint $x_1+x_2 \leq 1$; $x_1+x_2 \leq 3$; $x_1+x_2 \geq 0$ and $x_1, x_2, x_3 \geq 0$. [5+10]

8.a) What are the advantages and disadvantages of simulation?

b) At Dr Raju's clinic patients arrive with an average duration of 12 minutes between one arrival and next. The average service time (treatment) is assumed to be 28 min. simulate the system till 11 am assuming to be starting from 9.00 am immediately after the clinic is opened. Also calculate average waiting per patient. [5+10]

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