Code No: 821AJ **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA II Semester Examinations, August - 2017
OPERATIONS RESEARCH

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

5 × 5 Marks = 25

1.a) What are the artificial variables? Explain their importance. [5]
b) State the degeneracy in transportation problem. How is it resolved? [5]
c) State and explain the optimal replacement policy when time and money value is considered. [5]
d) Explain the terms i) Saddle point ii) MaxMin and Min max criterion iii) Strategies. [5]
e) Explain about various associated costs of inventory. [5]

PART - B

5 × 10 Marks = 50

2.a) Define model. Classify the models with respect to their physical configuration.
b) The manufacturer of patent medicines is proposed to prepare a production plan for medicines A and B. There are sufficient ingredients available to make 20,000 bottles of medicine A and 40000 bottles of medicine B but there are only 45000 bottles into which either of medicines can be filled. Further, it makes three hours to prepare enough material to fill 100 bottles of medicine A and one hour to prepare enough material to fill 1000 bottles of medicine B and there are 66 hours available for this operation. The profit is Rs.8 per bottle for medicine A and Rs.7 per bottle for medicine B. Formulate this problem as a LPP in order to maximize profit and solve it by graphical method. [4+6]

OR

3. Solve the LPP problem by Big M method:

$$Max\ Z = 4x_1 + 5x_2 - 3x_3 + 50$$
$$st\ x_1 + x_2 + x_3 = 10$$
$$x_1 - x_2 \geq 1$$
$$2x_1 + 3x_2 + x_3 \leq 40 \quad x_i \geq 0 \forall i$$

[10]

4.a) Give the mathematical formulation of a transportation problem.
b) Use North-west corner method to obtain an initial basic feasible solution of the transportation problem & find the optimal solution. [4+6]

Factory \ Warehouse	W	X	Y	Z	Supply
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

OR

5.a) State the optimality and reduction theorems for solving the assignment problems.

b) A company has a team of four salesmen and there are four districts where the company wants to start its business. After taking into account the capabilities of salesmen and the nature of districts, the company estimates that the profit per day in rupees for each salesman in each district is as below.

		Districts			
		D_1	D_2	D_3	D_4
Sales man	S_1	16	10	14	11
	S_2	14	11	15	15
	S_3	15	15	13	12
	S_4	13	12	14	15

Find the assignment of salesmen to various districts which will yield profit? [4+6]

6. The time spent in hours in processing two jobs on six machines A, B, C, D, E and F and the necessary technological orderings of machines are as follows.

Job 1:	A.20	C.10	D.10	B.30	E.25	F.15
Job 2:	A:10	C.30	B.15	D.10	F.15	E.20

Use graphic method to determine an optimal sequence of jobs which minimizes the elapsed time. [10]

OR

7. The following failure rates have been observed for a certain type of light bulbs:

End of week	Probability of failure to date
1	0.05
2	0.13
3	0.25
4	0.43
5	0.68
6	0.88
7	0.96
8	1.00

The cost of replacing an individual failed bulb is Rs.1.25. The decision is made to replace all bulbs simultaneously at fixed intervals and also to replace individual bulbs as they fall in service. If the cost of group replacement is 30 paise per bulb, what is the best interval between group replacement? At what group replacement price per bulb would a policy of strictly individual replacement become preferable to the adopted policy? [10]

8. Solve the following LPP by dynamic programming approach

$$Max\ Z = x_1 + 9x_2$$
$$st \quad 2x_1 + x_2 \le 25$$
$$x_2 \le 11, \quad x_i \ge 0 \forall i$$

[10]

OR

9.a) State and explain the dominance principles.

b) Solve the following game using dominance property. [4+6]

Player A \ Player B	B_1	B_2	B_3
A_1	1	7	2
A_2	6	2	7
A_3	5	2	6

10.a) Derive an expression for EOQ when demand rate is uniform, production rate is finite and shortages are not allowed

b) If a product is to be manufactured within the company, the details are as follows:
Annual demand rate, λ =24000 units
Production rate, K=48000 units
Setup cost, C_r=Rs. 200 per setup
Carrying cost, C_c= Rs.20/unit/year.
Find the i) EOQ and ii) Cycle time. [4+6]

OR

11.a) Explain about various types of customers in the queuing system

b) In a bank, cheques are cashed at a single "teller" counter. Customers arrive at the counter in a Poisson manner at an average rate of 30 customers/hr. The teller takes on an average 1.5 minutes to cash a cheque. The service time has been shown to be exponentially distributed.
i) Calculate the percentage of time the teller is busy
ii) Calculate the average time a customer is expected to wait. [4+6]

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