Code No: 117FZ

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year I Semester Examinations, April/May - 2018

OPERATIONS RESEARCH

(Common to ME, CSE, IT, MCT, AME, MIE, MSNT, AGE)

Time: 3 Hours **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

(25 Marks)

1.a) List out various phases of OR. [2]

b) Explain the importance of slack, surplus and artificial variables. [3]

c) What is meant by degeneracy in transportation problem? [2]

d) State the variants of assignment problem and how are they resolved. [3]

e) State the steps involved in Johnson's algorithm. [2]

f) Derive the optimal replacement policy when time value of money is considered. [3]

g) State the dominance rules. [2]

h) State the assumptions of basic EOQ model. [3]

i) State the assumptions of queuing capacity and queuing discipline in different queuing models. [2]

j) State the steps involved in simulation modeling and Analysis of the system. [3]

Part-B

(50 Marks)

2.a) Define OR. Classify OR models according to problem for which they are developed and explain.

b) Old hens can be bought at Rs.2 each and young ones at Rs.5 each. The old hens lay 3 eggs per week and young ones lay 5 eggs per week each egg being worth 30 paise. A hen (young or old) costs Rs.1 per week to feed. I have only Rs.80 to spend for hens. How many of each kind should I buy to give a profit of more than Rs.6 per week assuming that I cannot house more than 20 hens. Formulate and solve it graphically. [10]

OR

3. Solve the following LPP problem by Big M method

$$Max\ Z = 4x_1 + 3x_2 + 5x_3$$

$$st \quad x_1 + 3x_2 + 2x_3 \le 10$$

$$2x_1 + 2x_2 + x_3 \ge 6$$

$$x_1 + 2x_2 + 3x_3 = 14, \quad x_i \forall i$$

[10]

4. Solve the following transportation problem for the optimal solutions. Use North-West corner method to generate initial BFS. [10]

Factory \ Warehouse	W	X	Y	Z	Availability
A	19	30	50	10	7
B	70	30	40	60	9
C	40	8	70	20	18
Requirement	5	8	7	14	

OR

5.a) Define Travelling salesman problem.

b) Solve the travelling salesman problem given by the following data.
$C_{12}=20$, $C_{13}=4$,$C_{14}=10$, $C_{23}=5$,$C_{24}=6$,$C_{25}=10$,$C_{35}=6$,$C_{45}=20$ where $C_{ij}=C_{ji}$ and there is no route between cities i and j if the value for C_{ij} is not shown. [5+5]

6. Consider following 3 machines(A,B,C) and 7 jobs problem, Find the optimal sequence if the processing order is ABC and also determine makespan time for the optimal sequence. [10]

Job	1	2	3	4	5	6	7
A	5	7	3	4	6	7	12
B	2	6	7	5	9	5	8
C	10	12	11	13	12	10	11

OR

7.a) State the optimal replacement policy for items when the time value of money is considered.

b) Assume that present value of one rupee to be spent in a year's time is Rs.0.90 and C=Rs.3000 capital equipment and the running costs are given in the table below

Year	1	2	3	4	5	6	7
Running cost (Rs.)	500	600	800	1000	1300	1600	2000

When should the machine be replaced? [5+5]

8.a) Explain the terms i) Maximin criteria ii) Minimax criteria iii) Pure strategy.

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

Player A	Player B		
	B_1	B_2	B_3
A_1	1	3	11
A_2	8	5	2

OR

9.a) Derive an expression for optimal batch size when demand and production rates are uniform and finite.

b) If a product is to be manufactured within the company, the details are as follows:
Annual demand rate, r=24000 units
Production rate, k=48000 units
Setup cost, C_0=Rs. 200 per setup
Carrying cost, C_c= Rs.20/unit/year. Find the i) EOQ and ii) Cycle time. [5+5]

10. Patients arrive at a clinic to a Poisson distribution at the rate of 30 patients per hour. The waiting room does not accommodate more than 14 patients. The examination time per patient is exponential with mean rate of 20 per hour.
a) Find the effective arrival rate at the clinic?
b) What is the probability that an arriving patient will not wait?
c) What is the expected waiting time until a patient is discharged from the clinic? [10]

OR

11. Find the shortest path from vertex A to K along arcs joining various vertices lying between A to K .Length of each path is given. [10]

	B	E	H
A	7	6	5

	C	F	I
B	3	4	-
E	6	7	10
H	-	7	10

	D	G	J
C	9	7	-
F	7	6	5
I	-	4	3

	K
D	3
G	9
J	8

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