Code No: 137FE

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, July/August - 2023
OPERATIONS RESEARCH
(Mechanical Engineering)

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

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	What is degeneracy in LPP? How do you resolve it?	[2]
b)	Prove that dual of the dual is the primal.	[3]
c)	Name two applications of traveling sales man problem.	[2]
d)	Distinguish between a balanced and an unbalanced transportation problem.	[3]
e)	What are the situations warranting replacement of an equipment?	[2]
f)	Briefly explain "present worth factor" in Replacement analysis.	[3]
g)	Define the terms: i) Inventory Horizon ii) Order Cycle.	[2]
h)	Briefly explain: i) pure strategy ii) mixed strategy iii) fair game.	[3]
i)	What is Bellman's principle of optimality?	[2]
j)	Give a brief description on Queue disciplines.	[3]

PART – B

(50 Marks)

2. Minimize $Z = 2x_1 + 3x_2$
Subject to $x_1 + x_2 \leq 4$
$3x_1 + x_2 \geq 4$
$x_1 + 5x_2 \geq 4$,
$0 \leq x_1 \leq 3$ & $0 \leq x_2 \leq 3$. [10]

OR

3. Food X contains 6 units of Vitamin A per gram and 7 units of Vitamin B per gram and costs 12 paise per gram. Food Ycontains 8 units of Vitamin A per gram and 12 units of Vitamin B and costs 20 paise per gram. The daily minimum requirements of Vitamin A and Vitamin B are 100 units and 120 units respectively. Find the minimum cost of product mix. Use simplex method. [10]

4. There are five jobs to be assigned on 5 machines and associated cost matrix is as follows:

Jobs \ Machines	1	2	3	4	5
A	11	17	8	16	20
B	9	7	12	6	15
C	13	16	15	12	16
D	21	24	17	28	26
E	14	10	12	11	15

Find the optimum assignment and associated cost using the assignment technique. [10]

OR

5. Determine the Optimum basic feasible solution to the following Transportation problem. [10]

From \ To	A	B	C	Available
1	50	30	220	1
2	90	45	170	3
3	250	200	50	4
Required	4	2	2	

6. A company has 6 jobs which go through 3 machines X, Y and Z in the order XYZ. The processing time in minutes for each job on each machine is as follows.

Machines \ Job	1	2	3	4	5	6
X	18	12	29	36	43	37
Y	7	12	11	2	6	12
Z	19	12	23	47	28	36

Find the optimal sequence, total elapsed time and idle times for each machine. [10]

OR

7. The initial price of equipment is Rs. 5000. The running cost varies as shown below.

Year	1	2	3	4	5	6	7
Running cost (Rs.)	400	500	700	1000	1300	1700	2100

Taking a discount rate of 0.09. Find out the optimum replacement interval. [10]

8. A and B play a game in which each has three coins a 5P, a 10P and 20P. Each selects a coin without the knowledge of the others choice. If the sum of the coins is an odd amount, A wins B's coins. If the sum is even B wins A's coins. Find the best strategy for each player and the value of the game. [10]

OR

9.a) Classify inventory models.

b) A company uses 24000 units of a raw material which costs Rs. 12.50 per unit. Placing each order costs Rs. 22.50 and the carrying cost is 5.4% per year of the average inventory. Find the economic order quantity and the total inventory cost (Including the cost of the material). [5+5]

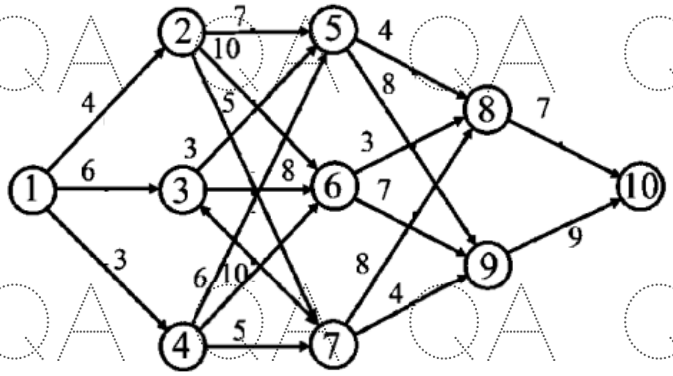
10.a) What are Kendal-Lee notations? Give examples.

b) Customers arrive at a box office window being managed by a single individual, according to a Poisson input process with mean rate of 30 per Hour. The time required to serve a customer as an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer. Also determine the average number of customers in the system and average queue length. [5+5]

OR

11.a) What are the characteristics of DPP?

b) A medical representative located at city has to travel to city 10. He knows the distance of alternative routes from city 1 to city 10 and has drawn the network map as shown in the following figure along with the distance between the cities. Find shortest possible route. Also find the shortest routes from any city to city 10. [5+5]



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