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Code No: 821AJ

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
MCA II Semester Examinations, October / November - 2020
OPERATIONS RESEARCH

Time: 2 Hours **Max.Marks:75**

Answer any five questions
All questions carry equal marks
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1. A company manufactures two kinds of machines, each requiring a different manufacturing technique. The deluxe machine requires 18 hours of labour, 8 hours of testing and yields a profit of Rs.400. The standard machine requires 3 hours of labour, 4 hours of testing and yields a profit of Rs.200. There are 800 hours of labour and 600 hours of testing available each month. A marketing forecast has shown that the monthly demand for the standard machine is to be more than 150. The management wants to know the number of each model to be produced monthly that will maximize total profit. Formulate and solve this as a linear programming problem. [15]

2. A nutrition scheme for babies is proposed by a committee of doctors. Babies can be given two types of food (I and II) which are available in standard sized packets weighing 50 grams. The cost per packet of these foods are Rs.2 and Rs.3. The Vitamin availability in each type of food per packet and the minimum vitamin requirement for each type of vitamin are summarized in table below:

Vitamin	Vitamin availability in type I food	Vitamin availability in type I I food	Minimum daily required vitamin
1	1	1	6
2	7	1	14
Cost/packet Rs.	2	3	

Develop a linear programming model to determine the optimal combination of food types with the minimum cost such that the minimum requirement of vitamin in each type is satisfied solve it by simplex method. [15]

3. A company as three factories at Amethi, Baghpat and Gwalior having production capacity of 5,000, 6,000 and 2,500 tonnes respectively. Four distribution centres at Allahabad, Bombay , Kolkata and Delhi requiring 6,000 tonnes 4,000 tonnes, 2,000 tonnes and 1,500 tonnes respectively of the product. The transportation costs in thousands of rupees per tonne from different factories to different centres are given as below:

Distribution centres

factories	Allahabad	Bombay	Kolkata	Delhi
Amethi	3	2	7	6
Bagphat	7	5	2	3
Gwalior	2	3	4	5

Suggest an optimum schedule and find the minimum cost of transportation. [15]

4. Consider the problem of assigning four sales persons to four different sales regions as shown below such that the total sales are maximized.

Sales region

	1	2	3	4
Sales man A	5	11	8	9
B	5	7	9	7
C	7	8	9	9
D	6	8	11	12

The cell entries represent annual sales figures in crore of rupees. Find the optimal allocation of the sales persons to different regions. [15]

5. Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC. Processing time in hours are given in the following table:

Job	1	2	3	4	5
M/c A	8	10	6	7	11
M/c B	5	6	2	3	4
M/c C	4	9	8	6	5

What is the total processing time for all the 5 jobs? Also find the idle time on each machine. [15]

6. A company is planning to replace an equipment by a new equipment whose first cost is Rs.1,00,000. The operating and maintenance cost of the equipment during its first year of operation is Rs.10,000 and it increases by Rs.2,000 every year thereafter. The resale value of the equipment at the end of the first year of its operation is Rs.65,000 and it decreases by Rs.10,000 every year thereafter. Find the economic life of the equipment by assuming the interest rate as 12%. [15]

7. Consider 4 × 4 game played by Players A and B and solve it optimally: [15]

Player B

	1	2	3	4
Player A1	6	2	4	8
A2	2	-1	1	12
A3	2	3	3	9
A4	5	2	6	10

8. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time (the time taken to hump the train) distribution is also exponential with an average of 36 minutes. Calculate
a) Expected queue size (line length)
b) Probability that the queue size exceeds 10.
c) If the input of trains increases to an average of 33 per day, what will the change in a and b? [15]

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