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Total Number of Pages: 02

Course: MBA
Sub_Code: 18MBA403D

4th Semester Regular/Back Examination: 2024-25
SUBJECT: Operations Research Applications
BRANCH(S): BA, FM, FM&HRM, GM, HRM, IB, MBA, MM
Time: 3 Hours
Max Marks: 100
Q.Code: S222

Answer Question No.1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions: (2 x 10)

- Explain the term State variable.
- Write mathematical model of transportation problem.
- What do you mean by Capacitated Vehicle Routing Problem
- Write Kendal and Lee notation of Queuing Model.
- What are the three types of queuing system?
- What are the components of queuing system?
- Write standard form of Quadratic programming?
- How quadratic programming does differs from LPP?
- What is vehicle routing problem? Why is it important
- What is best fit bin packing?

Part-II

Q2 Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve) (6 x 8)

- What are the techniques used in Operations Research? Explain.
- What is operations research? Describe its characteristics.
- Write the characteristics of dynamic programming.
- Explain computational procedure for the solution of all integer programming problem by Gomory method.
- What are the Solutions for Solving Vehicle Routing Problems?
- Discuss the cutting-plane algorithm for solving integer programming problems.
- Describe basic features of dynamic Programming.
- What are the factors affecting portfolio optimization?
- Explain advantages of branch bound method.
- Using Dynamic programming, Determine the value of U_1 , U_2 , and U_3 so as to $\text{Max } Z = U_1.U_2.U_3$
Subject to constraints $U_1 + U_2 + U_3 = 10$
 $U_1, U_2, U_3 \geq 0$

- k) A T.V repairman repair the sets in the order in which they arrive and expects that the time required to repair a set has an ED with mean 30 mins. The sets arrive in a Poisson fashion at an average rate of 10/8 hours a day.
- I. What is the expected idle time / day for the repairman?
 - II. How many TV sets will be there awaiting for the repair?
- l) A company has three production facilities S1, S2, and S3 with production capacity of 7, 9, and 18 units (in 100s) per week of a product, respectively. These units are to be shipped to four warehouses D1, D2, D3, and D4 with requirement of 5, 8, 7, and 14 units (in 100s) per week, respectively. The transportation costs (in rupees) per unit between factories to warehouses are given in the table below: Formulate this transportation problem as an LP model to minimize the total transportation cost.

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	34

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

(16 x 2)

- Q3 What are the phases of operations Research method? (16)
- Q4 Use branch and bound technique to solve the following problem (16)
- Max $Z = 7X_1 + 9X_2$
 S.C $-X_1 + 3X_2 \leq 6$
 $7X_1 + X_2 \leq 35$
 $0 \leq X_1, X_2 \leq 7$
 X_1 and X_2 are integer
- Q5 A vessel is to be loaded with stocks of 3 items. Each unit of item (i) has a weight (w_i) and value (r_i).The maximum cargo weight of the vessel can take is 5 and the details of the three items are as follows: (16)

I	1	2	3
Wi	1	3	2
ri	30	80	65

Develop the recursive equation for the above case and find the most valuable cargo load without exceeding the maximum cargo weight by using dynamic programming.

- Q6 a) What is quadratic Programming? Explain Wolf's method in solving it. (8 x 2)
- b) The processing time and due dates for 5 jobs A, B, C, D, and E are given in the table below:

Job	A	B	C	D	E
Processing Time(days)	20	18	16	22	17
Due date (days from Now)	28	32	37	27	52

Sequences these jobs according to EDD rule and calculate
 (I) Total completion time (II) Total flow time (III) Average Flow Time
 (IV) Average number of jobs in the system (V) Average job lateness.