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**DHANALAKSHMI SRINIVASAN COLLEGE
OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)**



(For Candidates admitted from 2019-2020 onwards)

UG DEGREE EXAMINATIONS APRIL – 2021

B.B.A – BUSINESS MANAGEMENT

OPERATION RESEARCH

Time: 3 Hrs

Max.Marks: 75

PART- A

CHOOSE THE CORRECT ANSWER

(10*1=10)

- Every mathematical model
 - Must be deterministic
 - requires computer aid for its solution
 - Represents data in numerical form
 - All of the above
- Constraints in an LP model represents
 - Limitations
 - requirements
 - Balancing limitations and requirements
 - all of the above
- The net evaluations for all the non- basic cells in T.P. are determined by the solution
 - $u_i + v_j = c_{ij}$
 - $z_{ij} - c_{ij} = u_i + v_j - c_{ij}$
 - $z = \sum_{i=1}^m \sum_{j=1}^n x_{ij} c_{ij}$
 - $z_{ij} + c_{ij} = u_i - v_j + c_{ij}$
- Transportation problem may have degenerate solution, if the number of
 - unoccupied cells is equal to $m+n-1$
 - unoccupied cells is less than $m+n-1$
 - occupied cells is atleast $m+n-1$
 - occupied cells is less than $m+n-1$
- The minimum number of lines covering all zeros in a reduced cost matrix of order n can be
 - atleast n
 - atmost n
 - $n-1$
 - $n+1$
- In an assignment problem involving 5 workers and 5 jobs, total number of assignments possible are:
 - $5!$
 - 10
 - 25
 - 5
- Economic order quantity results in
 - equalization of carrying cost and procurement cost
 - favourable procurement price
 - reduced chances of stock outs
 - minimization of set up cost
- Which of the following is not an assumption underlying fundamental EOQ problem?
 - Demand is known and uniform
 - Lead time is not zero
 - Shortages are not permitted
 - Holding cost per unit per year is constant

9. The problem of replacement is not concerned about the
- replacement of an equipment when it gradually deteriorate.
 - replacement of an equipment when it ceases to work.
 - maintaining of an equipment to work out profitability.
 - Determination of optimum replacement interval.
10. The sudden failure among items is seen as
- Progressive
 - retrogressive
 - random
 - all of the above

PART - B

ANSWER ALL THE QUESTIONS:

(5×7=35)

11. a) A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes namely suitings, shirtings and woolens yielding a profit of Rs.2, Rs.4 and Rs.3 per minute respectively. One metre of suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing. Similarly one metre of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing. One metre of woolen requires 3 minutes in each department. In a week, total run time of each department is 60, 40 and 80 hours for weaving, processing and packing respectively. Formulate the linear programming problem to find the product mix to maximize the profit.

(OR)

- b) Explain briefly the applications of Operations Research.
12. a) Find the starting solution in the following transportation problem by North west corner method:

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
requirement	200	225	275	250	

(OR)

- b) Find the starting solution in the following transportation problem by Least cost method:

	D ₁	D ₂	D ₃	D ₄	Capacity
O ₁	1	2	3	4	6
O ₂	4	3	2	0	8
O ₃	0	2	2	1	10
Demand	4	6	8	6	

13. a) A computer centre has got three expert programmers. The centre needs three application programmes to be developed. The Head of the computer centre, after studying carefully the programmes to be developed, estimates the computer time in minutes required by the experts to the application programmes as follows:

		Programmes		
		A	B	C
Programmers	1	120	100	80
	2	80	90	110
	3	110	140	120

Assign the programmers to the programmes in such a way that the total computer time is least.

(OR)

- b) Solve the travelling salesman problem given by the following data:

$C_{12} = 20, C_{13} = 4, C_{14} = 10, C_{23} = 5, C_{25} = 10, C_{35} = 6, C_{45} = 20, C_{34} = 6$ ($C_{ij} = c_{ji}$) and there is no route between cities i and j if a value for C_{ij} is not shown.

14. a) An oil engine manufacturer purchases lubricants at the rate of Rs.42 per piece from a vendor. The requirement of these lubricants is 1,800 per year. What should be the order quantity per order, if the cost per placement of an order is Rs.16 and inventory carrying charge per rupee per year is only 20 paise.

(OR)

- b) You have to supply your customers with 100 units of a certain product every Monday (and only then). You obtain the product from a local supplier at Rs.60 per unit. The cost of ordering and transportation from the supplier are Rs.150 per order. The cost of carrying inventory is estimated at 15% per year of the cost of the product carried. Determine the optimum cost.

15. a) The cost of a machine is Rs.6100 and its scrap value is Rs.100. The maintenance costs found from experience are as follows:

Year	:	1	2	3	4	5	6	7	8
Maintenance cost(Rs.)	:	100	250	400	600	900	1200	1600	2000

When should the machine be replaced?

(OR)

- b) Following table gives the running costs per year and resale price of a certain equipment whose purchase price is Rs.5000.

Year	:	1	2	3	4	5	6	7	8
Running cost(Rs.)	:	1500	1600	1800	2100	2500	2900	3400	4000
Resale value(Rs.)	:	3500	2500	1700	1200	800	500	500	500

At what year is the replacement due?

PART - C

ANSWER ANY THREE QUESTIONS:

(3×10=30)

16. Solve by graphical method:

$$\text{Minimize } z = 2x_1 + x_2$$

subject to the constraints:

$$5x_1 + 10x_2 \leq 50, x_1 + x_2 \geq 1, x_1 \leq 4; x_1, x_2 \geq 0$$

17. Obtain an optimum basic feasible solution to the following transportation problem

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	

18. Solve the following assignment problem:

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	15

19. A dealer supplies you the following information with regard to a product dealt in by him:
 Annual demand: 10, 000 units; ordering cost: Rs. 10 per order; price: Rs. 20 per unit.
 Inventory carrying cost: 20% of the value of inventory per year. The dealer is considering the possibility of allowing some back- order (stock-out) to occur. He has estimated that the annual cost of back-ordering will be 25% of the value of inventory.

i) What should be the optimum number of units of the product he should buy in one lot?

ii) What quantity of the product should be allowed to be back- ordered, if any?

iii) What would be the maximum quantity of inventory at any time of the year?

20. The following failure rates have been observed for a certain type of transistors in a digital computer:

End of the week	:	1	2	3	4	5	6	7	8
Probability of failure to date	:	.05	.13	.25	.43	.68	.88	.96	1.00

The cost of replacing an individual failed transistor is Rs.1.25. The decision is made to replace all these transistors simultaneously at fixed intervals, and to replace the individual transistors as they fail in service. If the cost of group replacement is 30paise per transistor, what is the best interval between group replacements? At what group replacement price per transistor would a policy of strictly individual replacement become preferable to the adopted policy?