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Question Paper Code: 55704

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

Fifth Semester

Mechanical Engineering

15UME504 - OPERATIONS RESEARCH

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Transportation problem is basically a CO1- R
(a) Maximization model (b) Minimization model
(c) Transshipment problem (d) Iconic model
2. In the simplex method for solving of LPP, the number of variables can be CO1- R
(a) Not more than three (b) At least two (c) At least three (d) None of them
3. North- west corner refers to CO2- R
(a) Top left corner (b) Top right corner (c) Both of them (d) None of them
4. If there are 'n' jobs and 'm' machines, there will be ----- sequences of doing the jobs. CO2- R
(a) $n \times m$, (b) $m \times n$, (c) n^m (d) $(n!)^m$
5. CPM is CO3- R
(a) Time oriented (b) Event oriented (c) Activity oriented (d) Target oriented
6. The major aspects of the critical path method are _____ CO3- R
(a) Planning & Scheduling (b) Planning & Implementation
(c) Planning & Organization (d) None of the above
7. An example of shrinkage costs includes CO4- R
(a) Income freight (b) Storage costs (c) Insurance (d) Clerical errors

8. What can be defined as a useful idle resource which has economic value
eg; raw materials, spare parts, finished items, etc? CO4- R
- (a) Inventory Control (b) Inventory (c) Inventory Planning (d) None of the above
9. In a M | M | 1 queue, the service rate is CO5- R
- (a) Poisson (b) Exponential (c) Linear (d) None of these
10. If the value of the game is zero, then the game is known as: CO5- R
- (a) Fair strategy (b) Pure strategy (c) Pure game (d) Mixed strategy

PART – B (5 x 2= 10 Marks)

11. List out the applications of operations research. CO1-U
12. What is degenerate basic feasible solution in transportation problem? CO2-U
13. What is the crashing of project network? CO3-U
14. What is buffer stock? CO4-U
15. What is queue? CO5-U

PART – C (5 x 16= 80 Marks)

16. (a) Solve the following LP problem using simplex method. CO1- App (16)

$$\text{Minimize } Z = 15X_1 + 6X_2 + 9X_3 + 2X_4$$

Subjected to

$$2X_1 + X_2 + 5X_3 + 6X_4 \leq 20$$

$$3X_1 + X_2 + 3X_3 + 25X_4 \leq 24$$

$$7X_1 + X_4 \leq 70$$

$$X_1, X_2, X_3, X_4 > 0$$

Or

- (b) 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 Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and costs 12 paise per gram. The daily minimum requirement of vitamin A and vitamin B is 100 units and 120 units respectively. Find the minimum cost of product mix by the simplex method CO1- App (16)

17. (a) Determine an initial basic feasible solution for the following Transportation Problem using least cost method. CO2- App (16)

		Destination				Supply
		D ₁	D ₂	D ₃	D ₄	
Origin	O ₁	6	4	1	5	14
	O ₂	8	9	2	7	16
	O ₃	4	3	6	2	5
Demand		6	10	14	4	35

Or

- (b) A small garment making unit has five tailors stitching five different types of garments. All the five tailors are capable of stitching all the five types of garments. The output per day per tailor and the Profit (Rs.) for each type of garment are given below: CO2- App (16)

Tailors	Garments				
	1	2	3	4	5
A	7	9	4	8	6
B	4	9	5	7	8
C	8	5	2	9	8
D	6	5	8	10	10
E	7	8	10	9	9
Profit (Rs.) per garment	2	3	2	3	4

Which type of garment should be assigned to which tailor in order to maximize profit, assuming that there are no other constraints?

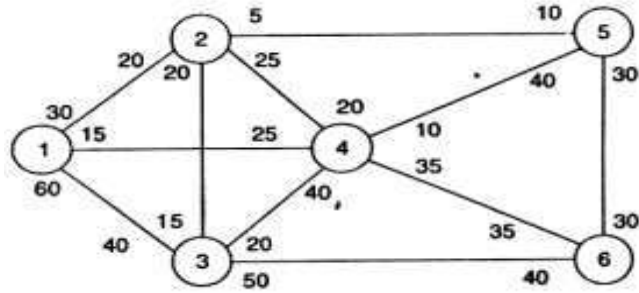
18. (a) (a) The following table shows the jobs of a network along with their time estimates. CO3 Ana (16)

Job	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
a (days)	1	2	2	2	7	5	5	3	8
m (")	7	6	14	5	10	5	8	3	17
b (")	13	14	26	8	19	17	29	9	32

Draw the project network and find the probability that the project is completed in 40 days.

Or

- (b) Consider the pipe network shown in figure which shows the flow capacities between various pairs of locations in both ways. Find the maximal flow from Node-1 to Node-6. CO3- Ana (16)



19. (a) The annual demand for an item is 3200 units. The unit cost is Rs.6/- and inventory carrying charges 25% per annum. If the cost of one procurement is Rs.150/-. Determine,
- (i) Economic order quantity
 - (ii) Time between two consecutive orders
 - (iii) Number of orders per year
 - (iv) The optimal total cost

Or

- (b) The maintenance cost and resale value per year of a machine whose purchase price is Rs. 7000 is given below

Year	1	2	3	4	5	6	7	8
Maintenance cost in Rs.	900	1200	1600	2100	2800	3700	4700	5900
Resale value in Rs.	4000	2000	1200	600	500	400	400	400

When should the machine be replaced?

20. (a) A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hours day. What is the repairman's expected idle time each day? How jobs are ahead of the average set just brought in.

Or

- (b) Reduce the following game by dominance and find the game value:

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

