

Reg. No. :

Question Paper Code : 10894

M.C.A. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

MC 5401 — RESOURCE MANAGEMENT TECHNIQUES

(Regulation 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the benefits of LPP?
2. What are the applications of duality principles?
3. What are the conditions for maintaining dual feasibility in solving unbalanced transportation problem?
4. What are the advantages of Assignment problem?
5. When do we go for Integer programming problem?
6. What is multi objective optimization?
7. Define Total Float and Independent Float.
8. Differentiate PERT and CPM.
9. Define the following : (a) Stage (b) State.
10. What are the Limitations of dynamic programming?

PART B — (5 × 13 = 65 marks)

11. (a) A firm plans to purchase atleast 200 quintals of scrap containing high quality metal X and low quality metal Y. It decides that the scrap to be purchased must contain atleast 100 quintals of X metal and not more than 35 quintals of Y metal. The firm can purchase scrap from two suppliers (A and B) in unlimited quantities. The percentage of X and Y metals in terms of weight in the scrap supplied by A and B is given in the table 1. The price of A scarp is Rs. 200 per quintal and that of B Rs. 400

per quintal. The firm wants to determine the quantities that it should buy from the two suppliers so that the total cost is minimized. Formulate the problem as LPP and solve it by using graphical method. (13)

Table 1 : Supplier data

Metals	Supplier A	Supplier B
X	25%	75%
Y	10%	20%

Or

(b) Discuss the steps involved in simplex method. (13)

12. (a) Consider the following transportation problem (Table 2) involving three sources and four destination. The cell entries represent the cost of transportation per unit. Obtain the initial feasible basic solution using the VAM method and the optimal solution using U-V method. (13)

Table 2

		Destination				Supply
		1	2	3	4	
Source	1	3	1	7	4	300
	2	2	6	5	9	400
	3	8	3	3	2	500
Demand		250	350	400	200	1200

Or

(b) Explain the steps involved in solving Assignment Problems. (13)

13. (a) Find the optimum integer solution using cutting plane algorithm to the following LPP. (13)

$$\text{Max } Z = 5X_1 + 8X_2$$

$$\text{Subject to } X_1 + 2X_2 \leq 8$$

$$4X_1 + X_2 \leq 10$$

$$X_1, X_2 \geq 0 \text{ and Integers}$$

Or

(b) Discuss the procedure adopted in branch and bound technique for Integer programming. (13)

14. (a) A Project consists of 12 activities. The Immediate Predecessors and time estimates of the activities are summarized in the table 3 :
- Draw the Network of the Project. (5)
 - Find the critical path and expected project completion time. (5)
 - What is the probability of completing the project on or before 30 weeks? (3)

Table 3 : Data of the activities

Activity	Immediate Predecessor (s)	Time Estimate (weeks)		
		Optimistic	Most Likely	Pessimistic
A	-	4	6	8
B	-	2	3	4
C	-	5	5	5
D	A	8	10	12
E	A	4	5	6
F	B,E	5	6	7
G	C	5	8	11
H	C	6	8	10
I	D	7	7	13
J	F, G	8	10	12
K	H	2	3	4
L	K	4	5	6

Or

- Discuss the procedure adopted in Resource Analysis in Network Scheduling. (13)
15. (a) Given arrival rate $\lambda = 8/\text{hour}$ and service is exponential with the mean $\mu = 9/\text{hour}$ and maximum people in the system restricted to 10. Find
- the probability the system is free. (3)
 - probability that a person entering the system does not see a queue. (3)
 - expected waiting time in the queue. (7)

Or

- A firm has several machines and wants to install own service facility for the repair of its machines. The average breakdown rate of the machines is three per day. The repair time has exponential distribution. The loss incurred due to lost time of an in operative machine is Rs. 40 per day. There are two repair factory available. Facility X has on installation cost of Rs. 20,000 and facility Y costs Rs. 40,000. The total labour cost per year for the two facilities is Rs. 5,000 and Rs. 8,000 respectively. Facility X can repair four machines daily, while facility Y can repair five machines daily. The life span of both the facility is four years. Which factory should be installed. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A small jewellery manufacturing company employs a person who is highly skilled gem cutter, and it wishes to use this person at least six hours per day for this purpose. On the other hand, the polishing facilities can be used in any amount upto 8 hours per day. The company specializes in three kinds of semi precious tones. P, Q and R relevant cutting, polishing and cost requirements are listed in the table. How many gem stones of each type should be processed each day to minimize the cost of finished stones? What is the minimum cost? Solve using Big-M Simplex Method. (15)

Details	P	Q	R
Cutting (hours)	2	1	1
Polishing (hours)	1	1	2
Cost per stone (Rs.)	30	30	10

Or

- (b) Derive the poisson queue model for (FIFO/N/∞). (15)