B.Tech. (Computer Science & Engineering / Computer Technology) Seventh Semester (C.B.C.S.)

Program Elective-IV : Optimization Techniques

P. Pages : 3 **PSM/KW/23/2878/2911**

Time : Three Hours * 2 5 8 7 * Max. Marks : 70

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Due credit will be given to neatness and adequate dimensions.
8. Assume suitable data whenever necessary.

1. a) Explain Stages of Development of operational Research. **7**

b) Graphically solve the following problem of LP Maximize. **7**

$3x1+2x2$

Subject to:

$2x1-3x2 \geq 0$

$3x1+4x2 \leq -12$

$x1, x2 \geq 0$

OR

2. a) Solve the following LP problem graphically Minimize **7**

$2x1+1.7x2$

Subject to:

$0.15x1+0.10x2 \geq 1.0$

$0.75x1+1.70x2 \geq 7.5$

$1.30x1+1.10x2 \geq 10.0$

$x1, x2 \geq 0$

b) Discuss the applications of O. R. Discuss the limitation of O.R. **7**

3. a) Consider a courier company that needs to deliver packages to different locations. The company can choose between two routes. Route X and Route Y. Each route has a different delivery time and associated costs. Use dynamic programming to determine the optimal route selection for delivering a package from Location A to Location B, considering time and cost as criteria, Provide a step by step solution. **7**

b) Consider a problem of making optimal subdivisions. Describe the dynamic programming approach to solving this problem and provide a step-by-step solution for a specific example. **7**

OR

4. a) Consider a problem of making optimal subdivisions. Describe the dynamic programming approach to solving this problem and provide a step-by-step solution for a specific example. **7**

b) Consider a courier company that needs to deliver packages to different locations. The company can choose between two routes: Route X and Route Y. Each route has a different delivery time and associated costs. Use dynamic programming to determine the optimal route selection for delivering a package from Location A to Location B, considering time and cost a criteria. Provide a step-by-step solution. **7**

5. a) Define PERT (Program Evaluation and Review Technique) and CPM (Critical Path Method) in project management. Discuss their origins and the primary differences between them. **7**

b) Explain Construction of Project Network Diagrams. **7**

Problem 1: Construct the network diagram for a project with the following activities:

Activity	Name of	Immediate

Event → Event	Activity	Predecessor Activity
1 → 2	A	-
1 → 3	B	-
1 → 4	C	-
2 → 5	D	A
3 → 6	E	B
4 → 6	F	C
5 → 6	G	D

OR

6. a) Discuss the concept of project crashing and its implications on project management. Provide a hypothetical scenario and explain how crashing can be used to expedite project completion. **7**

b) Draw the network diagram and determine the critical path for the following project: **7**

Activity	Time estimate (Weeks)
1 - 2	5
1 - 3	6

1 - 4	3
2 - 5	5
3 - 6	7
3 - 7	10
4 - 7	4
5 - 8	2
6 - 8	5
7 - 9	6
8 - 9	4

7. a) A fast-food restaurant has one cashier to take orders, and customers arrive at the restaurant according to a Poisson distribution with a rate of 10 customers per hour. The cashier can serve customers with an average rate of 15 customers per hour. Calculate the average number of customers waiting in the queue and the average time a customer spends in the queue (M/M/1: co/FCFS queuing model). **7**

b) The manager of a company wants to apply crashing for the following project by spending an additional amount not exceeding Rs. 2,000. Offer your suggestion to the manager. **7**

Activity	Predecessor Activity	Normal Time (Weeks)	Crash Time (Weeks)	Normal Cost (Rs.)	Crash Cost (Rs.)
A	-	20	19	8,000	10,000
B	-	15	14	16,000	19,000
C	A	22	20	13,000	14,000
D	A	17	15	7,500	9,000
E	B	19	18	4,000	5,000
F	C	28	27	3,000	4,000
G	D, E	25	24	12,000	13,000

OR

8. a) Explain the concept of crashing of a project. Explain the criterion for selection of an activity **7**

b) A project has activities with the following normal and crash times and cost: **7**

Activity	Predecessor Activity	Normal Time (Weeks)	Crash Time (Weeks)	Normal Cost (Rs.)	Crash Cost (Rs.)
A	-	4	3	8,000	9,000
B	A	5	3	16,000	20,000
C	A	4	3	12,000	13,000
D	B	6	5	34,000	35,000
E	C	6	4	42,000	44,000
F	D	5	4	16,000	16,500
G	E	7	4	66,000	72,000
H	G	4	3	2,000	5,000

9. a) Solve the M/M/1 queuing model with co/FCFS (constant service rate and first-come, first-served) for a given set of parameters. Include calculations for average waiting time and utilization. **7**

b) Explain the EOQ (Economic Order Quantity) model in inventory management. Discuss its assumptions and benefits. Provide a numerical example to calculate the EOQ and total inventory cost. **7**

OR

10. a) An organization has the following procurement pattern of six items irrespective of their demand level. Reduce the inventory levels while keeping total number of orders/year fixed. **7**

Item No.	Number of Orders/Year	Demand (Rs.)	Order size (Rs.)	Average Inventory
1	5	2000,000	500000	250000
2	5	700,000	260000	130000
3	5	100,000	23500	11750
4	5	9,000	10000	5000
5	5	5,000	700	350
6	5	2,700	500	250

b) Discuss the advantages and disadvantages of deterministic inventory models compared to probabilistic inventory models. Provide real-world examples for each type of model. **7**

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