PGDCS / M.C.A. First Semester (Second Year) (CGS)

15523 : Computer Oriented Optimization Techniques : 3 MCA 5

P. Pages : 4 | AU - 3163

Time : Three Hours | Max. Marks : 80

* 0 9 3 1 *

Notes : 1. All question carry equal marks.
2. Diagram and chemical equations should be given wherever necessary.

1. a) Give the classification of problems in O.R. **4**

b) A NGO is devoted to improving health care in under developed countries. It has five medical teams available for the purpose. Presently it has selected three countries as target. The NGO needs to determine how many teams to allocate to each of three countries to maximize the total effectiveness of the five teams. The measure of effectiveness is additional man years of life. The following table gives the estimated additional man years life (in thousand) for each country for each possible allocation of medical teams. Find the optimum allocation of terms. **10**

No. of medical teams	Country I	Country II	Country III
0	0	0	0
1	45	20	50
2	70	45	70
3	90	75	90
4	105	110	100
5	120	150	130

OR

2. a) What is dynamic programming problem. State its characteristics. **5**

b) Find the shortest route in the network represented by following table figures shows the distance in kilometers. **9**

	To City →								
From City ↓	2	3	4	5	6	7	8	9	10
1	4	6	3	-	-	-	-	-	-
2	-	-	-	7	10	5	-	-	-
3	-	-	-	3	8	4	-	-	-
4	-	-	-	6	10	5	-	-	-
5	-	-	-	-	-	-	4	8	-
6	-	-	-	-	-	-	3	7	-
7	-	-	-	-	-	-	8	4	-
8	-	-	-	-	-	-	-	-	7
9	-	-	-	-	-	-	-	-	9

3. a) Define the terms ; 3
   i) Slack variable
   ii) Surplus variable
   iii) Artificial variable

   b) Solve the following ℓ.p.p. by two phase simplex method. 10

Min $Z = x_1 + x_2$

subject to $2x_1 + 4x_2 \geq 4$

$x_1 + 7x_2 \geq 7$

$x_1, x_2 \geq 0$

OR

4. a) Solve the following ℓ.p.p. by big-M method. 13

Min $Z = 5x_1 + 3x_2$

subject to $2x_1 + 4x_2 \leq 12$

$2x_1 + 2x_2 = 10$

$5x_1 + 2x_2 \geq 10$

$x_1, x_2 \geq 0$

5. a) A firm has four retail outlets and four salesmen available. Each salesman can attend each outlet and the average sales generated by each salesman at every outlet are tabulated below (in thousand) 6+7

		Outlet			
		R_1	R_2	R_3	R_4
Salesman ↓	S_1	50	45	60	40
	S_2	38	42	50	42
	S_3	36	35	38	38
	S_4	24	25	30	28

i) Find the optimum assignment of salesman to outlets that maximize the total sales.
ii) Now, suppose the firm has fifth salesman S_5 available to her and his performance at different outlets in terms of sales (in thousand) is as follows :

Outlet	R_1	R_2	R_3	R_4
Salesman : S_5	48	46	57	45

Should fifth salesman be hired ? If yes, who should be replaced ?

OR

6. Obtain the feasible solution to the following transportation problem by - 3+
   i) North - West corner rule 4+
   ii) Least cost method 6
   iii) Vogel's approximation method.

	D_1	D_2	D_3	D_4	b_j
O_1	5	8	4	1	40
O_2	3	5	6	2	60
O_3	2	2	5	7	50
a_i	35	55	30	30	

7. a) What is all integer programming problem ? Explain Gomory's cutting plane method to solve it. 7

b) Solve the following sequencing problem 6

Job	P	Q	R	S	T	U
Machine X	5	4	6	2	1	4
Machine Y	3	2	4	1	3	1

OR

8. a) A firm works 40 hours a week and has a capacity of overtime work to the extent of 20 hours in a week. It has received seven orders to be processed on three machines A, B and C in the order A, B, C to be delivered in a weeks time from now. The processing times are (in hours) are recorded below. 13

Job	1	2	3	4	5	6	7
Machine A	7	8	6	6	7	8	5
Machine B	2	2	1	3	3	2	4
Machine C	6	5	4	4	2	1	5

The manager insists on performing the jobs in the sequence in which they are received. He is refusing to accept eighth order, which requires 7, 2 and 5 hours respectively on A, B and C machines, because according to him the eighth job would require a total of 61 hours for processing, which exceeds the firm's capacity what is your advice to him ?

9. a) Two dice are thrown simultaneously. Write down the sample space and hence calculate the probability that (i) both the faces bear same number & (ii) sum of the face numbers is 7. 7

b) A decision maker has obtained following loss table. 2+5

	State of nature		
Act ↓	S_1	S_2	S_3
a_1	4	7	3
a_2	5	2	4
a_3	8	6	10
a_4	3	1	9

i) Find minimax decision.
ii) If $P(S_1) = 0.5$, $P(S_2) = 0.4$ & $P(S_3) = 0.1$,
find Baye's decision using EOL criteria.

OR

10. a) In a bag there are 10 tiles numbered 1 to 10. 4 tiles are selected at random from the bag and their numbers were noted. What is the probability that largest number is 6. 5

b) Mr. Sam is planning a business tour from Mumbai to Hyderabad on 15th of a month. However, there is a call for 'Rasta Roko' movement for Telangana on the same day. So Mr. Sam is having following options : 8

a_1 : To cancel the tour.
a_2 : To goto Hyderabad and if faced to Rasta Roke, come back
a_3 : To go to Hyderabad one day in advance the loss table is estimated as follows :

Options	Rasta Roko done (S_1)	Rasta Roko not done (S_2)
a_1	100	50
a_2	120	-25
a_3	-50	20

i) Find minimax decision

ii) If the probability of Rasta Roko done is 0.4. find expected loss associate to each option and hence optimum decision.

11. a) Solve the following game graphically. 7

$$\begin{bmatrix} 2 & -5 \\ 4 & 2 \\ 1 & 1 \\ -2 & 2 \\ 0 & 3 \end{bmatrix}$$

b) The following table lists the jobs of a network alongwith their time estimates. 7

Job	Duration (days)		
	Optimistic	Most likely	Pessimistic
1 - 2	3	6	15
1 - 6	2	5	14
2 - 3	6	12	30
2 - 4	2	5	8
3 - 5	5	11	17
4 - 5	3	6	15
6 - 7	3	9	27
5 - 8	1	4	7
7 - 8	4	19	28

i) Draw network
ii) Calculate expected duration, variance of the project and critical path.

OR

12. a) Explain the terms : 6
i) Maximin principle
ii) Minimax principle
iii) Saddle point

b) The activities and their time estimates of a project are listed below : 8

Activity	t_o (days)	t_m (days)	t_p (days)
1 - 2	7	9	17
1 - 3	10	20	60
1 - 4	5	10	15
2 - 5	50	65	110
2 - 6	30	40	50
3 - 6	50	55	90
3 - 7	1	5	9
4 - 7	40	48	68
5 - 8	5	10	15
6 - 8	20	27	52
7 - 8	30	40	50

Draw network and find ET, TE, TL, SE and critical path.

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