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SEAT No. :

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[6204]-25

First Year M.C.A. (Management)

MT-21: OPTIMIZATION TECHNIQUES

(Revised 2020 Pattern) (Semester-II)

Time : 2½ Hours] *[Max. Marks :60*

Instructions to the candidates:

1) *All questions are compulsory.*
2) *Use of statistical table and non-programable calculator is allowed.*
3) *Figures to right indicate full marks.*

Q1) Use the simple method to solve the following LP problem

Maximize $z = 4x_1 + 3x_2 + 6x_3$ subject to the constraints **[10]**

$2x_1 + 3x_2 + 2x_3 \leq 440,$

$4x_1 + 3x_3 \leq 470,$

$2x_1 + 5x_2 \leq 430$ and $x_1, x_2, x_3 \geq 0$

OR

Solve the following L.P.P by two-phase method **[10]**

Minimize $z = 15/2a - 3b + 0c$ subject to the constraints

$3a - 1b - 1c \geq 3$

$1a - 1b + 1c \geq 2a, b, c$ all ≥ 0

Q2) a) The 'School of International studies for Population' found out, through its survey, that the mobility of the population (in per cent) of a state to a village, town and city is in the following percentages. **[7]**

		To		
		Village	Town	City
From	Village	50	30	20
	Town	10	70	20
	City	10	40	50

What will be the proportion of population in vilage, town and city after two years, given that the present population has proportions of 0.7, 0.2 and 0.1 in the village, town and city, respectively?

b) Explain the following essential components of decision model [3]

i) Decision alternatives

ii) States of nature

iii) Payoff

OR

a) A company manufactures around 200 mopeds. Depending upon the availability of raw materials and other conditions, the daily production has been varying from 196 mopeds to 204 mopeds, whose probability distribution is as given below: [7]

Production/day:	196	197	198	199	200	201	202	203	204
Probability:	0.05	0.09	0.12	0.14	0.20	0.15	0.11	0.08	0.06

The finished mopeds are transported in a specially designed three storied lorry that can accommodate only 200 mopeds, Using the following 15 random

numbers: 82, 89, 78, 24, 53, 61, 18, 45, 23, 50, 77, 27, 54 and 10, simulate the mopeds waiting in the factory?

i) What will be the average number of mopeds waiting in the factory?

ii) What will be the number of empty spaces in the lorry?

b) Explain three types of three types of decision making environments in brief [3]

Q3) a) A manufacturing company processes 6 different jobs on two machines A and B in the order AB. Number of units of each job and its processing times in minutes on A and B are given below. Find the optimal sequence and total elapsed time and idle time for each machine. [7]

Job Number	Number of units of each job	Machine A : time in minutes	Machine B: time in minutes
1	3	5	8
2	4	16	7
3	2	6	11
4	5	3	5
5	2	9	7.5
6	3	6	14

b) ABC Corporation wants to launch one of its mega campaigns to promote a special product. The promotion budgets not yet finalized, but they know that some Rs. 55,00,000 is available for advertising and promotion. **[3]**

Management wants to know how much they should spend for television spots, which is the most appropriate medium for their product. They have created five T.V. campaign strategies' with their projected outcome in terms of increase in sales. Find which one they have to select to yield maximum utility. The data required is given below.

Strategy	Cost in lakhs of Rs.	Increased in sales in laksh of Rs.
A	180	1.78
B	2.00	2.02
C	2.25	2.42
D	2.75	2.68
E	3.20	3.24

OR

a) A machine operator has to perform three operations, namely plane turning, step turning and taper turning on a number of different jobs. The time required to perform these operations in minutes for each operating for each job is given in the matrix given below. Find the optimal sequence, which minimizes the time required. **[7]**

Job.	Time for plane turning In minutes	Time for step turning in minutes	Time for taper turning in minutes
1	3	8	13
2	12	6	14
3	5	4	9
4	2	6	12
5	9	3	8
6	11	1	13

b) What are the components of the decision tree? **[3]**

Q4) A project consists of 9 activities and the three-time estimates are given below. Find the project completion time (TE). Draw the network for the given project and find the project completion time? **[10]**

Activities		Days		
i	*j*	T_0	T_L	T_P
10	20	5	12	17
10	30	8	10	13
10	40	9	11	12
20	30	5	8	9
20	50	9	11	13
40	60	14	18	22
30	70	21	25	30
60	70	8	13	17
60	80	14	17	21
70	80	6	9	12

OR

A small project is composed of 7 activities whose time estimates are listed below activities are being identified by their beginning **[10]**

i) And ending

ii) Node numbers

Activities		Time in weeks		
i	j	t_0	t_l	t_P
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

i) Draw the network

ii) Calculate the expected variances for each

iii) Find the expected project completed time

iv) Calculate the probability that the project will be completed at least 3 weeks than expected

v) If the project due date is 18 weeks, what is the probability of not meeting the due date

Q5) a) Players A and B play a game in which each has three coins, a 5p, 10p and a 20p. Each selects a coin without the knowledge of the other's choice. if the sum of the coins is an odd amount, then A wins B's coin But, if the sum is even, then B wins A's coin. Reduce using Principal of dominance and check the saddle point. **[7]**

b) The following matrix gives the payoff of different strategies (alternatives) S_1, S_2, S_3 against conditions (events) N_1, N_2, N_3 and an4: **[3]**

	N_1	N_2	N_3	N_4
S_1	₹ 4,000	₹ –100	₹6,000	₹18,000
S_2	20,000	5,000	400	0
S_3	20,000	15,000	–2,000	1,000

Indicate the decision taken under the regreat approach

OR

a) Two competitors are competing for the market share of the similar product. The payoff **[7]**

Matrix in terms of their advertising plan is shown below:

Competitor A	Competitor B: No Advertising	Competitor B: Medium Advertising	Competitor B: Heavy Advertising
No Advertising	10	5	–2
Medium Advertising	13	12	13
Heavy Advertising	16	14	10

Suggest optimal strategies for the two firms and the net outcome thereof.

b) Explain the any one quantitative method that is useful for decision-making under uncertainty with example. **[3]**