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SEAT No. :

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F.Y.M.C.A. (Management)

MT - 21 : OPTIMIZATION TECHNIQUES

(2020 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 50*

Instructions to the candidates:

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

Q1) Attempt the following MCQs (0.5 marks each). **[10]**

a) In the LPP set of basic variables which are appeared in linear problem consist of

i) Slack & real variables
ii) Slack & artificial variables
iii) Departing basic variables
iv) Departing non basic variables

b) Objective of sequencing problem is to find possible _____which minimize total elapsed time

i) Sequence
ii) Ratio
iii) Solution
iv) Order

c) Floats for critical activities will be always_____.

i) Zero
ii) One
iii) Smallest
iv) Largest

d) Type of decision making environment is

i) Risk
ii) Certainty
iii) Uncertainty
iv) All of these

e) A game is said to be fair if

i) both upper and lower values of the game are same & zero
ii) Upper & lower values of game are not equal
iii) Upper value is more than lower value of game
iv) None of these

f) The determine (s) the equilibrium of Markov process_____.

i) Original state probabilities
ii) State vector
iii) Transition matrix
iv) Fundamental matrix

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g) LPP involving more than two variables can be solved by
   i) Simplex method
   ii) Graphical method
   iii) Matrix minima method
   iv) Hungerian method

h) Time during which machine remains waiting or vacant in sequencing problem is called_____time.
   i) Processing
   ii) Waiting
   iii) Idle
   iv) Free

i) Full form of CPM is_____.
   i) Critical path method
   ii) Control path method
   iii) Critical plan management
   iv) Control path management

j) Which of the following criterion is not used for decision making under uncertainty
   i) Maximin
   ii) Minimax
   iii) Maximax
   iv) Minimize expected loss

k) A mixed strategy game can be solved by
   i) algebraic method
   ii) graphical method
   iii) matrix method
   iv) all of these

l) Assigning random numbers in Monte carlo simulation it is important to_____.
   i) Develop cumulative probability distribution
   ii) Use random numbers from random number table
   iii) Use only single set of random numbers
   iv) Use excel spreadsheets

m) In simplex method feasible basic solution must satisfied.
   i) Non negativity constraint
   ii) Negativity constraint
   iii) Basic constraint
   iv) Common constraint

n) Total time required to complete all the jobs in a job sequencing problem is known
   i) elapsed time
   ii) idle time
   iii) processing time
   iv) processing order

o) Shortest possible time in which an activity can be achieved under ideal circumstances is known as_____.

i) Pessimistic time estimate ii) Optimistic time estimate
iii) Expected time estimate iv) Most likely time estimate

p) The difference between expected profit under conditions of risk and expected profit with perfect information is called_____.

i) EvPI ii) EMI
iii) EV iv) None of these

q) Game theory models are classified by the

i) no. of players ii) sum of payoff
iii) no. of strategies iv) all of these

r) The condition that system can be in only one state at any point in time is known as

i) Transient state ii) Absorbent condition
iii) Mutually exclusive condition iv) Collectively exhaustive condition

s) Objective function of linear programming problem is

i) Constraint ii) Function to be optimized
iii) Relation between variables iv) None of these

t) Full form of PERT is

i) Program evaluation & Rate technology
ii) Program evaluation & Robot technique
iii) Project evaluation & robot technology
iv) Program evaluation & review technique.

Q2) a) Solve following LPP **[6]**

Maximize $z = 50\,x_1 + 100\,x_2$

Subject to constraints

$x_1 + x_2 \leq 150$

$2x_1 + 3\,x_2 \leq 360$

$x_1, x_2 \geq 0$

b) Find the saddle point and determine the optimal strategies for the game **[4]**

$$\begin{array}{cc} & \begin{matrix} B_1 & B_2 & B_3 \end{matrix} \\ \begin{matrix} A \\ \end{matrix} & \begin{bmatrix} A_1 \\ A_2 \\ A_3 \end{bmatrix} \begin{bmatrix} 4 & 0 & 2 \\ 6 & -1 & 4 \\ 8 & -5 & -3 \end{bmatrix} \end{array}$$

OR

a) Solve following LPP. **[6]**

Maximize $z = 7x_1 + 6x_2$

Subject to constraints

$x_1 + x_2 \leq 4$

$2x_1 + x_2 \leq 6$

$x_1, x_2 \geq 0$

b) Solve the following game **[4]**

	Player B	
Player A	B1	B2
A1	3	5
A2	4	1

Q3) a) Small project consist 7 activities whose time estimates are as follows **[6]**

Activity	Estimated Duration (weeks)		
(i-j)	Optimistic	Most likely	Pessimistic
(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

Determine:

i) Draw network diagram & identify critical path.

ii) Identify critical activities & duration of project.

iii) Determine probability of completing project in 13 weeks.

b) In a toy manufacturing company suppose product acceptance probability are not known but following data known. **[6]**

Anticipated 1st year profit (Rs. '000')

		Acceptance	
Product	Full	Partial	Minimal
Good	8	70	50
Fair	50	45	40
Poor	–25	–10	0

Determine optimal decision under

i) Maximax

ii) Maximin

iii) Minimax regret criteria

OR

Q3) a) The time & cost estimates of different activities are as given below. **[6]**

Activity	Time(weeks)		Cost (Rs.)	
(i-j)	Normal	CRash	Normal	Crash
(1-2)	3	2	300	400
(2-3)	3	3	30	30
(2-4)	7	5	420	580
(2-5)	9	7	720	810
(3-5)	5	4	250	300
(4-5)	0	0	0	0
(5-6)	6	4	320	410
(6-7)	4	3	400	470
(6-8)	13	10	780	900
(7-8)	10	9	1000	1200

Indirect cost is Rs. 50 per weeks.

i) Draw the net work & identify critical path.

ii) Crash relevant activities systematically & find optimal project duration & cost.

b) A major consumer goods manufacturer wishes to decide new product bring out in the market which of the profit table is as follows (Profit per in units of Rs. 10000). **[6]**

Strategies	States		
	$S_1(0.4)$	$S_2(0.5)$	$S_3(0.1)$
A1	140	100	80
A2	160	130	120
A3	200	160	140

Determine:-

i) Expected monetary value (EMV).

ii) Expected monetary value with-perfect information (EMVPI).

iii) Value of perfect information.

Q4) a) Seven jobs are to be processed through 2 machines A & B processing time (in hrs) are as follows. **[6]**

Jobs	1	2	3	4	5	6	7
Machine-A	10	9	7	15	18	20	14
Machine-B	12	8	7	12	10	6	13

Determine:

i) Sequence of jobs.

ii) Idle time for machine A & B.

b) A market survey is made on 3 brands of breakfast foods *x, y, z*. Every time customer purchases new package following estimates for shift (in percent) are obtained. **[4]**

	Next		
Present	X	Y	Z
X	70	20	10
Y	30	50	20
Z	30	30	40

It is estimated that 30% people buy brand *x*, 20% buy brand y & 50% buy brand z. What will be the distribution of the customers for first and second period.

OR

a) 5 Jobs are to be processed through 3 machines processing time (in hrs) are as follows. **[6]**

Determine:

i) Sequence of jobs.

ii) Elapsed time for machine A, B & C.

Jobs	1	2	3	4	5
Machine-A	10	11	8	7	6
Machine-B	6	4	5	3	2
Machine-C	9	5	4	6	8

b) Market share of brands A. B & C are 50%, 30% & 20% customers shift their brands in matrix as below. **[4]**

From	To		
	A	B	C
A	50%	30%	20%
B	20%	70%	10%
C	20%	20%	60%

Find:

i) Transition matrix for brands.

ii) Find share at the end of period 1 & 2.

Q5) a) Distribution of demand for books has been found following information. **[4]**

Demand	15	16	17	18	19	20	21	22
No. of Copies	0.05	0.08	0.20	0.45	0.10	0.07	0.03	0.02

Generate demand for 20 times period using following random numbers, also calculate average no. of copies demand.

14, 2, 93, 99, 18, 71, 37, 30, 12, 10, 88, 13, 00, 57, 69, 32, 18, 8, 92, 73

b) Explain the terms. **[4]**

i) Basic solution.

ii) Dummy activity.

OR

a) A confectioner sells items past data of demand per week is given below. **[4]**

Demand in (kg)	0	5	10	15	20	25
Probability	0.04	0.22	0.16	0.42	0.10	0.06

Generate demand for next 10 weeks & average demand per week using random numbers-

78, 99, 43, 62, 44, 2, 67, 32, 54, 75

b) Explain the terms: **[4]**

i) Degenerate solution.

ii) Float.

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