Total No. of Questions : 5]

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[5865] - 205

First Year M.C.A. (Management Faculhy)

MT-21 : OPTIMIZATION TECHNIQUES

(2020 Pattern) (Semester - II)

Time : 2½ Hours] *[Max. Marks : 50*

Instructions to the condidates:

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

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

i) A minimization problem can be converted into maximization problem by changing the sign of coefficients in the _______

a) Constraint
b) Objective Function
c) Both a and b
d) None of the Above

ii) The order in which machines are required for completing job is called as

a) Machine order
b) Job order
c) Processing order
d) Working order

iii) Floats for critical activities will be always

a) one
b) zero
c) highest
d) same as duration of the activity

iv) Problems based on the phenomenon of decision making under risk are referred to as______.

a) Numerical problem
b) Complex problem
c) Probabilistic problem
d) None of above

v) The saddle point in a payoff matrix is always the ______.

a) largest number in the matrix
b) smallest number in its column and the smallest number in its row
c) smallest number in the matrix
d) largest number in its column and the smallest number in its row

vi) As simulation is not an analytical model, therefore the result of simulation must be viewed as

a) Unrealistic

b) Exact

c) Approximation

d) Simplified

vii) If in a LPP, the solution of a variable can be made infinity large without violating the constraints, the solution is _______.

a) Infeasible

b) Unbounded

c) Alternative

d) None of the above

viii) In sequencing if smallest time for a job belongs to machine A then that job has to placed towards ______ in the sequence.

a) right

b) left

c) centre

d) none of the Above

ix) Backward Pass calculation are done to find _______occurance times of events.

a) tentative

b) definite

c) latest

d) earliest

x) In the Hurwicz approach, coefficient of Pessimism is denoted by

a) α

b) $1-\alpha$

c) $1/\alpha$

d) α^2

xi) In a mixed strategy, each player should optimize the

a) maximum payoffs

b) lower value of the game

c) maximum

d) expected gain

xii) A problem is classified as Markov chain provided

a) There are finite number of possible states

b) States are collectively exhaustive & mutually exclusive

c) Long-run probabilities of being in a particular state will be constant over time

d) All of the Above

xiii) In simplex method, if there is tie between a decision variable and a slack (or surplus) variable for entering, ______ should be selected.

a) Slack variable b) Surplus variable

c) Decision variable d) None of the above

xiv) To identify the optimal sequence, a 3 machine (Three machine) problem has to be converted into _____ machine problem.

a) 1 b) 2

c) m d) none of the above

xv) CPM stands for ______

a) Control Path Method b) Critical Path Method

c) Control Path Management d) Critical Plan Management

xvi) The minimin criterion is used when consequences are given in the form of _______

a) Probabilities b) Table

c) Opportunity loss d) Payoff

xvii) Each player should follow the same strategy regardless of the other player's strategy in which of the following games?

a) Constant strategy b) Mixed strategy

c) Pure strategy d) Dominance strategy

xviii) In Markov analysis, state probabilities must

a) Sum to one b) Be less than one

c) Be greater than one d) None of the above

xix) ________ are the entities whose values are to be determined from the solution of the LPP.

a) Objective function b) Decision variables

c) Constraints d) Opportunity costs

xx) The longest path in the network diagram is called path

a) best b) worst

c) sub-critical d) critical

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

Maximize $Z = -2x_1 - x_3$

Subject to

$x_1 + x_2 - x_3 \geq 5$

$x_1 - 2x_2 + 4x_3 \geq 8$

$x_1, x_2, x_3 \geq 0$

b) Solve the game for the given pay-off matrix **[4]**

−5	3	1	20
5	5	4	6
−4	−2	0	−5

OR

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

Maximize $Z = 3x_1 + 2x_2$

Subject to constraints:

$x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, x_2 \geq 0$

b) The following is the pay-off matrix of a game being played by A and B. Determine the optimal strategies for player and the value of the game. **[4]**

B's strategy

		B_1	B_2
A's strategy	A_1	9	−6
	A_2	−5	5

Q3) a) The following information regarding a project is given **[6]**

Activity	Immediate Predecessor	Time in days		
		Most optimistic	Most likely	Most pessimistic
A	-	4	6	8
B	A	5	7	15
C	A	4	8	12
D	B	15	20	25
E	B	10	18	26
F	C	8	9	16
G	E	4	8	12
H	D,F	1	2	3
I	G,H	6	7	8

i) Construct an arrow diagram for this problem.

ii) Determine the critical path and compute the expected completion time.

iii) Determine the probability of completing the project in 55 days.

b) Consider the following profit table along with given probabilities of each state. **[6]**

	States		
	N_1	N_2	N_3
	Probabilities		
Strategies	0.3	0.6	0.1
S_1	20	18	-9
S_2	25	15	10
S_3	40	-10	12

Calculate

i) EMV

ii) EVPI

iii) VPI

OR

a) For the data given in the table below, draw the network, crash systematically the activities and determine the optimal project duration and cost. **[6]**

Activity	Time(week)		Cost in Rs. (000)	
	Normal	Crash		Crash
1-2	2	1	10	15
1-3	8	5	15	21
2-4	4	3	20	24
3-4	1	1	7	7
3-5	2	1	8	15
4-6	5	3	10	16
5-6	6	2	12	36

i) Draw the project network.

ii) Determine the critical path & the normal duration and associated cost.

iii) Crash the activities so that the project completion time reduces to 9 weeks, with minimum additional cost.

b) A manufacturer of cycle has estimated the following distribution of demand for a particular type of bicycle. **[6]**

Demand	0	1	2	3	4	5	6
Probability	0.14	0.27	0.27	0.18	0.09	0.04	0.01

Each cycle costs his Rs. 7,000 and he sells them Rs. 10,000 each. Any cycle that are left unsold at the end of the season must be disposed off for Rs. 6,000 each. How many cycles should be in the stock so as to maximize his expected profit?

Q4) a) A company has to process five items on three machines A, B and C. Processing times are given in the following table. **[6]**

Item	Ai	Bi	Ci
1	4	4	6
2	9	5	9
3	8	3	11
4	6	2	8
5	3	6	7

i) Find the sequence that minimizes the total elapsed time.

ii) Find the idle times for all the machines.

b) The number of units of an item that are withdrawn from the inventory on a day to day basis is a Markov chain process in which the requirements for tomorrow depend on today's requirements. A one-day transition matrix is given below. **[4]**

		Tomorrow		
		5	10	12
	5	0.6	0.4	0.0
Today	10	0.3	0.3	0.4
	12	0.1	0.3	0.6

i) Develop a two day transition matrix.

ii) Comment how a two - day transition matrix might be helpful to a manager who is responsible for the inventory management.

OR

a) Seven Jobs are to be processed through 2 machines A and B. Processing times (in hours) are given below: **[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

Find the elapsed time and idle times for machnies A and B.

b) The present market shares of three brands of soft drinks are 60%, 30% and 10% respectively. The transition probability matrix is as follows: **[4]**

$$P = \begin{pmatrix} 0.7 & 0.2 & 0.1 \\ 0.2 & 0.6 & 0.2 \\ 0.1 & 0.1 & 0.8 \end{pmatrix}$$

i) Find their expected market shares after two years.

ii) Find their long-term market shares.

Q5) a) Rainfall distribution in monsoon season as follows: **[4]**

Rain in cm	0	1	2	3	4	5
Probability	0.50	0.25	0.15	0.05	0.03	0.02

Simulate the rainfall for 10 days using following random numbers 67, 63, 39, 55, 29, 78, 70, 6, 78, 76. Find the average rainfall.

b) Explain the following terms with example. **[4]**

i) Degeneracy

ii) Multiple optimal solution in LPP

OR

a) A bakery keeps stock of a popular brand of cake. Previous experience shows the daily demand pattern for the item with associated probabilities, as given below: **[4]**

Daily demand (number)	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days.

Random numbers : 25, 39, 65, 76, 12, 05, 73, 89, 19, 49

Also estimate the daily average demand for the cakes on the basis of the simulated data.

b) Explain the following terms with examples: **[4]**

i) Dummy activity

ii) Optimistic time.