Set C

M.Sc. (MATHEMATICS)
Semester - 3
[OPERATION RESEARCH]
[SET-C]

Full Marks : 70
Time : 3 hours

Answer any five question in which Qe. No. - 1 is compulsory.

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP - A
(Compulsory)

1 × 10 = 10

1. Choose the correct answer:

(i) Costs arise due to the items in stock being out of fashion or the items undergoing chemical changes during storage is called
(a) storage costs (b) Depreciation Costs
(c) Handling costs. (d) None of these.

(ii) Semifinished goods or goods in process which are stored during the production process is called
(a) Work-in-process inventory (b) Raw material inventory
(c) finished goods inventory (d) None of these.

(iii) In crashing of activities
(a) we should always concentrate on critical path and choose between critical activities only.
(b) the minimum time in which a project can be completed would be given by the length of the critical path
(c) both (a) and (b)
(d) none of the above

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(iv) Which of the following is not correct ?
(a) Information about the float times for various activities is essential in effective resource levelling.
(b) It is possible to reduce an activity's duration below its crash time by allocating more resources and funds to it.
(c) A project scheduling problem can be formulated as LPP.
(d) None of these.

(v) An activity which does not consume either any resource and time is known as
(a) dummy activity (b) successor activity
(c) predecessor activity (d) None of these

(vi) While solving an IPP, any non-integer variable in the solution is picked up to
(a) leave the solution (b) Obtain the cut constraint
(c) enter the solution (d) None of the above.

(vii) In an Integer Programming Problems, rounding off solution values of decision variables ~~in~~ in LPP may not be acceptable, because
(a) it may violates non-negative conditions
(b) it does not satisfy the constraints
(c) objective function value of the IPP is more than (less than) the objective function value
(d) none of the above

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(viii) When maximin and minimax values of the game are same, then
(a) there is a saddle point (b) strategies are mixed
(c) solution does not exist (d) None of the above

(ix) The size of the pay-off matrix of a game can be reduced by using the principle of
(a) rotation reduction (b) dominance
(c) game transpose (d) game inversion

(x) For a two person zero-sum game, the value of the game can be
(a) Positive, negative or zero.
(b) determined only if the game is fair
(c) determine only if the pay-off matrix has a saddle point
(d) None of these

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Answer any four questions
Each question carries 15 marks

4 X 15 = 60

2. (a) Derive an economic lot size formula for the optimum production quantity 'q' per cycle (i.e, per production run) of a single product so as to minimize the total average variable cost per unit time, where
(i) demand is uniform at a rate of R quantity units per unit time,
(ii) lead time is zero (or known exactly),
(iii) production rate is infinite, i.e, production is instantaneous, (iv) shortages are not allowed,
(v) holding cost is rupees c_1 per quantity unit per unit time, (vi) set-up cost is rupees c_3 per set-up

(b) Find the EOQ for the following data: [10]
Annual usage = 1,000 pieces
Expediting cost = Rs. 4 per order
Cost per piece = Rs. 250
Inventory holding cost = 20% of average inventory
Ordering cost = Rs. 6 per order
Material holding cost = Re. 1 per piece.

3. Discuss the rules of network construction. Give the advantages of network (PERT/CPM) and give difference between PERT and CPM. [5]

4. (a) For the project represented by the network diagram, find the earliest and latest times to reach each node, given the following data. [10] [15]

Task	A	B	C	D	E	F	G	H	I	J	K
Least time	4	5	8	2	4	6	8	5	3	5	6
Greatest time	8	10	12	7	10	15	16	9	7	11	13
Most likely time	5	7	11	3	17	9	12	6	5	8	9

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4(b) Give the rules of Network construction [5]

5. Discuss the advantages of the branch and bound method. Distinguish between linear programming problem and integer linear programming problem. What is the need for integer programming [15]

6. Solve the following integer linear programming problem using the cutting-plane algorithm [15]

Maximize $Z = 3x_1 + x_2 + 3x_3$

subject to the constraints:

$-x_1 + 2x_2 + x_3 \leq 4$, $4x_2 - 3x_3 \leq 2$, $x_1 - 3x_2 + 2x_3 \leq 3$;

x_1, x_2 and x_3 are all non-negative integers.

7 (a) Obtain the optimal strategies for both-persons and the value of the game for zero-sum two-person game whose pay off matrix is as follows: [10]

$$\begin{bmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{bmatrix}$$

(b) Explain the following terms:

(i) Minimax criterion (ii) Optimal strategy

(iii) Minimax and maximin [5]

Group-B

8. Use the property of dominance to solve the rectangular game whose pay-off matrix to A is as follows:

A \ B	I	II	III	IV	V	VI
I	0	0	0	0	0	0
II	4	2	0	2	1	1
III	4	3	1	3	2	2
IV	4	3	7	-5	1	2
V	4	3	4	-1	2	2
VI	4	3	3	-2	2	2

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Answers of objective Question [Q.No-1]

Q1. (i) (b) (ii) (a) (iii) c (iv) (b) (v) (a)
(vi) (b) (vii) (d) (viii) (a) (ix) (b) x (a)