Seat No. _____

Third Year B. C.A. Examination

Paper – BCA-304 [Operations Research]
Subject Paper Code No. 8897

Marks : 100

Time : 3 Hours
Instructions :   (1) There are FIVE compulsory questions in this Q. Paper.
               (2) Use of Scientific calculator is allowed.
      Instruction: 1) There are FIVE compulsory questions in this Q. Paper
               2) Graph papers will be provided on request.

Q1 a) Describe briefly the applications of operation research in different area [10]
        giving suitable examples
    b) Define operations research. Give in brief, an overview of various operation [10]
        research techniques.

                              OR

Q1 a) Explain the role of computer in solving current and future operations [10]
        research problems.
    b) State various advantages and disadvantages of operations research [10]
        techniques.

Q2 a) State giving example of each of the following terms: [10]
                i. Objective function,
                ii. Basic feasible solution,
                iii. Slack variable,
                iv. Surplus variable, and
                v. Artificial variable in L.P.P.

    b) Use Big M- method to solve the following problem.   [10]
            Minimize $Z = X_1 - 3X_2 + 2X_3$
            Subject to : $3X_1 - X_2 + 2X_3 \leq 7$
                         $2X_1 - 4X_2 \geq -12$
                         $-4X_1 + 3X_2 + 8X_3 \leq 10$, $X_1 \geq 0$, $X_2 \geq 0$ & $X_3 \geq 0$

                              OR

Q2 a) What do you mean by Linear Programming Problem? Give its mathematical [10]
        formulation. Why it is called L.P.P.?
    b) A firm manufactures headache pills in 2 sizes A and B. Size A contains 2 [10]
        grains of aspirin, 5 grains of bicarbonate and 1 grain of codeine. Size B
        contains 1 grain of aspirin, 8 grains of bicarbonate and 6 grains of codeine. It
        is found by users that it requires at-least 12 grains of aspirin, 74 grains of
        bicarbonate and 24 grains of codeine for providing immediate effect. It is
        required to determine the least number of pills a patient should take to get
        immediate relief. Formulate the problem and solve it graphically.

Q3 a) What is a transportation problem? Give its mathematical formulation. [10]
Explain the least cost method of finding initial solution of transportation problem.

b) Given the following transportation problem, [10]

WAREHOUSE	FACTORIES				REQUIRMENTS
	A	B	C	D	
1	13	14	25	10	110
2	50	9	11	21	90
3	31	17	12	13	120
4	8	6	17	50	230
5	20	10	15	17	160
AVAILABILITY	200	175	150	25	

Find an optimal transportation schedule. Compute optimal Cost.

OR

Q3 a) Explain the Hungarian method to solve an assignment problem. [6]

b) Explain the problem of degeneracy occurs in transportation problem. [6]

A marketing manager has 5 salesmen and 5 sales districts. Considering [08] the capabilities of the salesmen and the nature of the districts, the marketing manager estimates that sales per month (00's RS) for each salesman in each district would be as follows-

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                D I S T R I C T S
SALESMAN↓   A     B     C     D     E
        A   32    38    40    28    40
        B   40    24    28    21    56
        C   41    27    33    30    37
        D   22    38    41    36    36
        E   29    33    10    35    39
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Find the assignment of salesmen to districts that maximizes sales.

Q4 a) What do you meant by Activity and Events in the network diagram? [8]

b) A project has the following activities and other characteristics: [12]

Activity		A	B	C	D	E	F	G	H	I
Preceding Activity		--	--	A	A	C	D	B	E,F	G
Time estimates (in weeks)	Optimistic	4	1	6	2	5	3	3	1	4
	Most likely	7	5	12	5	11	6	9	4	19
	Pessimistic	16	15	30	8	17	15	27	7	28

i. Draw the PERT network diagram.
ii. Compute expected time and variance time of all activities for project scheduling.

iii. Compute Total Float of all events and identify the critical path.
iv. Determine the mean project completion time.

OR

Q4 a) Explain the following terms in network analysis   [12]
   i. Slack of an Event,   ii. Total & Free Float of an Activity,
   iii. Critical Path of a network.

b) The following table gives the activities in construction project and time [08]
   duration.

Activity	Predecessor Activity	Duration (in days)
A	-	20
B	-	25
C	A	10
D	A	12
E	B,C	5
F	D,E	10

i. Draw the project network
ii. Determine critical path and the total project duration.

Q5 a) What is a problem of Replacement? Discuss the practical uses of replacement   [10]
   and maintenance models.

b) Determine the optimum sequence for the jobs, total elapsed time and idle   [10]
   time on each machine for the following jobs on two machines.

Jobs	1	2	3	4	5
Machine I	15	9	17	12	19
Machine II	11	15	16	17	13

OR

Q5 a) Discuss the optimal policy criteria for replacement of items whose running   [10]
   cost increases with time and value of money also charges with time.

b) A fleet owner finds from his past records that the costs per year of running an   [10]
   auto whose purchase price is Rs. 60,000 are as given below:

Year	1	2	3	4	5	6	7	8
Running costs(Rs.)	10000	12000	14000	18000	23000	28000	34000	40000
Resale price (Rs.)	30000	15000	7500	3750	2000	2000	2000	2000

Determine at what age is its replacement due?