MRD – 04

B.C.A. (Semester – V) Examination, October 2018
NON-COMPUTER SCIENCE (Elective – I)
Operations Research

Duration : 2 Hours Max. Marks : 50

Instructions : *1)* ***All*** *questions are* ***compulsory****, however* ***internal*** *choice is provided from Q. **2** to Q. **5**.*
2) ***Use*** *of calculators is* ***permitted****.*
3) Graph will be ***provided*** *on request.*
4) Figures to the ***right*** *indicates* ***full*** *marks.*

(5×2=10)

1. Answer the following :
   A) Explain the steps involved in the formulation of Linear Programming problem.
   B) Define standard primal and dual problem.
   C) Explain the dominance rule in game theory.
   D) Briefly explain the transportation problem. Write the necessary and sufficient condition for the existence of the feasible solution to it.
   E) Define demand and order cycle in inventory control theory.

5

2. A) Solve the following L.P.P. using graphical method.

Maximize $Z = 40x_1 + 35x_2$

Subject to, $2x_1 + 3x_2 \leq 60$

$4x_1 + 3x_2 \leq 96$

$x_1, x_2 \geq 0$

5

B) Solve the following L.P.P. by simplex method.

Max. $Z = 3x_1 + 5x_2 + 4x_3$

Subject to the constraints,

$2x_1 + 3x_2 \leq 8$

$2x_2 + 5x_3 \leq 10$

$3x_1 + 2x_2 + 4x_3 \leq 15$

$x_1, x_2, x_3 \geq 0$

OR

2. I) One unit of product A contribute ₹ 8 and requires 3 units of raw materials and 2 hrs. of labour. One unit of product B contributes ₹ 6 and requires 3 units of raw material and one hour of labour. Availability of raw material at present is 48 units and that of labour is 40 hours. Formulate this as a linear programming problem and solve it.

5

P.T.O.

II) Apply Simplex method to solve the following L.P.P. 5

Minimise cost $Z = 60x_1 + 80x_2$

Subject to $20x_1 + 30x_2 \geq 900$

$40x_1 + 30x_2 \geq 1200$

$x_1, x_2 \geq 0$.

3. A) What are the main objectives of transportation model ? Explain briefly the steps involved in transportation model. 5

B) Solve the following game graphically and find the value of the game. 5

		Player B			
		b_1	b_2	b_3	b_4
Player A	a_1	8	5	−7	9
	a_2	−6	6	4	−2

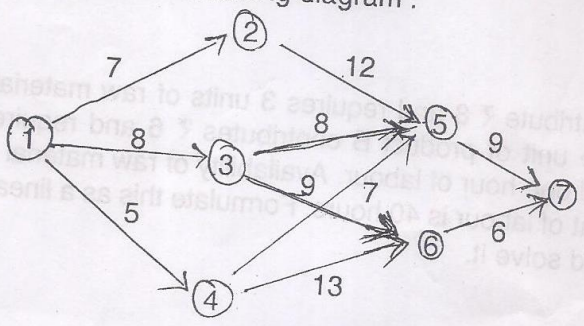
OR

3. I) Use Vogel's approximation method to find the initial feasible solution to the following transportation problem : 5

		Destination			
		D	E	F	Supply
Source	A	6	4	1	50
	B	3	8	7	40
	C	4	4	2	60
	Demand	20	95	35	

II) The annual demand of a product is 100000 units. The rate of production is 200000 units per year. The set up cost per production is ₹ 500 and the variable production cost of each item is ₹ 10. The annual holding cost per unit is 20% of its value. Find the optimum production lot size and the lengths of the production run. 5

4. A) Use Dynamic programming to find the shortest path between the two end modes in the following diagram : 5



B) Determine the saddle-point solution, the associated pure strategies and the value of the game for the following game : 5

Player B

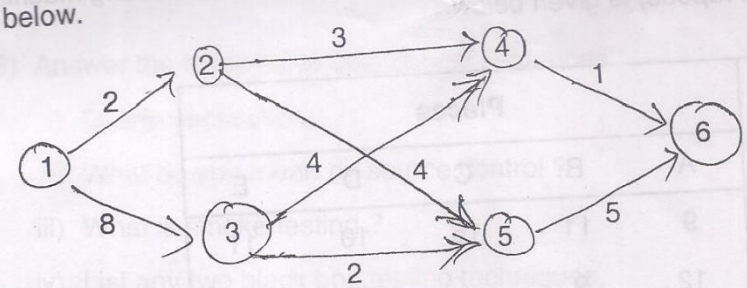
Player A	B_1	B_2	B_3	B_4
A_1	8	−2	9	−3
A_2	6	5	6	8
A_3	−2	4	−9	5

OR

4. I) Find the optimal solution for the cost and supply/demand matrix as given below : 5

Supply points	Destinations				Supply
	D_1	D_2	D_3	D_4	
P_1	19	30	50	12	7
P_2	70	30	40	60	10
P_3	40	10	60	20	18
Demand	5	8	7	15	35

II) Find the shortest route between node 1 and node 6 in the network given below. 5



5. A) There are 7 jobs each of which have to go through machine A and B in order A, B. Processing time in hours is given in the table. Calculate elapsed time and find the Idle time of both machines and to Idle time of the system. 5

Jobs	1	2	3	4	5	6	7
Machine A	3	12	15	6	10	11	9
Machine B	8	10	10	6	12	1	3

B) A pipeline is due for repairs. It will cost ₹ 10,000 and last for 3 years. Alternatively a new pipeline can be laid at a cost of ₹ 30,000 and last for 10 yrs. Assuming cost of repairs to be 10% and ignoring salvage value, which alternative should be chosen ? **5**

OR

5. I) Find the sequence for the following 8 jobs that will minimize the total elapsed time for the completion of all jobs. Each jobs is processed in the same order C, A, B. Entries are given for the processing time in hours in the table. Find the idle time for all machines and find the total idle time. Also find the total elapsed time of the system. **5**

Machines	1	2	3	4	5	6	7	8
A	4	6	7	4	5	3	6	2
B	8	10	7	8	11	8	9	13
C	5	6	2	3	4	9	15	11

II) In the modification of a plant lay out of a factory, four new machines M_1, M_2, M_3, M_4 are to be installed in a machine shop. There are five vacant places A, B, C, D and E available. Because of the limited space, machine M_2 can not be placed at C and M_3 cannot be placed at A. The cost of locating machine i to place j (in rupees) is given below.

Machines	Places				
	A	B	C	D	E
M_1	9	11	15	10	11
M_2	12	9	–	10	9
M_3	–	11	14	11	7
M_4	14	8	12	7	8

Find the optimal assignment schedule. **5**