JD – 09

B.C.A. (Semester – V) Examination, October 2017
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 calculator is* ***permitted****.*
3) Graph paper will be provided if ***needed****.*
4) Figures to the ***right*** *indicate* ***full*** *marks.*

1. Answer the following. **(5×2=10)**
   a) State the different steps in the formulation of L.P.P.
   b) Define a queue. What are the ingredients of a queue ?
   c) State the different replacement policies.
   d) Explain the transportation problem. What are the necessary and sufficient condition for the existence of feasible solution to it.
   e) What is game theory ? What are its limitations ?

2. A) Solve the following problem graphically. **5**

   Maximise $Z = 3x + 4y$

   Subject to $2x + y \leq 10$

   $x + 3y \leq 12$

   $x + y \leq 6$

   $x, y \geq 0.$

   B) Solve the following problem using simplex method. **5**

   Maximise $Z = 3x + 2y$

   Subject to $x + y \leq 4$

   $x - y \geq 2$

   $x, y \geq 0.$

   OR

P.T.O.

II. x) A firm makes two types of products A and B and sells them at a profit of ₹ 2 on type A and ₹ 3 on type B. Each product is processed on 2 machines G and H. Type A requires 1 minute of processing time on G and 2 minutes on H. Type B require 1 minute on G and 1 minute on H. Machine G is available for not more than 6 hours 40 minutes while H is available for 10 hours during any working day. Formulate the problem as L.P.P. **5**

y) Apply Duality concept for the following minimisation problem. **5**

Minimize $Z = 40x + 24y$

Subject to $20x + 50y \geq 4{,}800$

$80x + 50y \geq 7200$

$x, y \geq 0.$

3. A) Describe the Inventory model where shortages are permitted. **5**

B) Solve the game for the following pay-off matrix. **5**

	b_1	b_2
a_1	−6	7
a_2	4	−5
a_3	−1	−2
a_4	−2	5
a_5	7	−6

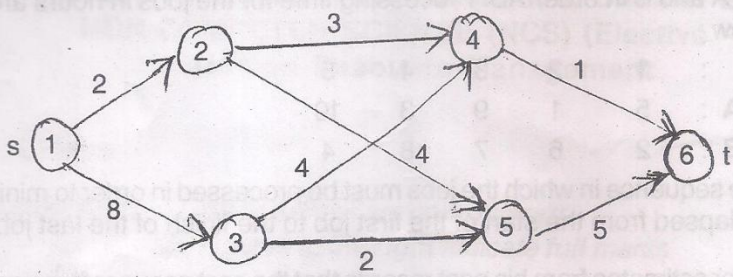
OR

III. x) The demand of an item is uniform at a rate of 25 units per month. The fixed cost is ₹ 30 each time a production is made. The production cost is ₹ 2 per item and the inventory carrying cost is 50 paise per unit per month. If the shortage cost is ₹ 3 per item per month, determine how often to make a production run and of what size ? **5**

y) Given the following pay-off matrix for player A obtain the optimum strategies for both players and determine the value of the game. **5**

	Player B		
Player A	3	8	−4
	10	11	13
	12	14	8

4. A) Find the shortest path between the two end nodes in the following network. 5



B) The transportation cost matrix for a given situation for supply of commodity from sources A, B, C to the point of usage P, Q and R is given below. Work out the optimal cost solution for the problem. 5

	P	Q	R	Supply
A	4	8	8	76
B	16	24	16	82
C	8	16	24	77
Demand	72	102	41	

OR

IV. x) Obtain an IBFS for the following T.P. by Vogel's Approximation method. 5

	D_1	D_2	D_3	D_4	Supply
O_1	8	10	7	6	50
O_2	12	9	4	7	40
O_3	9	11	10	8	30
Demand →	25	32	40	23	120

y) A TV repairman finds that the time spent on his job has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day. What is his expected idle time each day ? How may jobs are ahead of the set just brought in ? 5

5. A) An operator has to schedule 5 jobs, each of which must be processed on two machines A and B in order AB. Processing time for the jobs in hours are given below : 5

Jobs	:	1	2	3	4	5
Machine A	:	5	1	9	3	10
Machine B	:	2	6	7	8	4

Decide the sequence in which the jobs must be processed in order to minimise the time elapsed from the start of the first job to the finish of the last job.

B) A taxi owner estimates from his past records that the cost per year for operating a taxi, whose purchase price, when new is ₹ 60,000 are given below : 5

Age (years)	:	1	2	3	4	5
Operating cost (₹)	:	10,000	12,000	15,000	18,000	20,000

After 5 years, the operating cost is ₹ 6,000 K where K = 6, 7, 8, 9, 10. If the resale value decreases by 10% of purchase price each year, what is the best replacement policy ?

OR

V. x) Six jobs 1 to 6 are to be processed on five machine A, B, C, D, E in order ABCDE. Find the optimal sequence of jobs, the total elapsed time (T) and the idle time for each of the machines. The processing times in hours are given below. 5

Jobs :	1	2	3	4	5	6
Machine A	8	13	8	11	13	9
Machine B	6	7	18	15	8	11
Machine C	1	2	5	2	6	4
Machine D	2	4	5	6	5	6
Machine E	5	1	4	3	6	7

y) Solve the following travelling salesman problem to minimize the distance (in km) travelled. 5

From city \ To city	A	B	C	D	E
A	∞	12	24	25	15
B	6	∞	16	18	7
C	10	11	∞	18	12
D	14	17	22	∞	16
E	12	13	23	25	∞