Sixth Semester B.E. Degree Examination, Dec.2017/Jan.2018
Operation Research

Time: 3 hrs.

Max. Marks:100

Note: *Answer any FIVE full questions, selecting atleast TWO questions from each part.*

PART – A

1 a. Define operation research. Briefly explain the characteristics of operation research.
(05 Marks)

   b. A company manufactures two products A and B. Each unit of 'B' takes twice as long to produce as one unit of A. and if the company were to produce only A it would have time to produce 2000 units per day. The availability of raw – materials is sufficient to produce 1500 units per day of both A and B combined. Product B requiring a special ingredient only 600units can be made per day. If A fetches a profit of Rs. 2 per unit and B a profit of Rs.4 per unit. Find the optimum product mix by formulating LPP.
(07 Marks)

   c. Solve the following LPP by graphical method :
   Max $z = 100x_1 + 40x_2$
   Subject to $5x_1 + 2x_2 \leq 1000$
   $\qquad\qquad 3x_1 + 2x_2 \leq 900$
   $\qquad\qquad x_1 + 2x_2 \leq 500$
   and $\quad x_1, x_2 \geq 0$.
(08 Marks)

2 a. Solve the following LPP by Big – M method :
   Maximize $z = -2x_1 - x_2$
   Subject to $\qquad 3x_1 + x_2 = 3$
   $\qquad\qquad 4x_1 + 3x_2 \geq 6$
   $\qquad\qquad x_1 + 2x_2 \leq 4$
   $\qquad\qquad x_1, x_2 \geq 0$.
(10 Marks)

   b. Find the dual of the following LPP and solve it.
   maximize $z = 5x_1 - 2x_2 + 3x_3$
   subject to $\qquad 2x_1 + 2x_2 - x_3 \geq 2$
   $\qquad\qquad 3x_1 - 4x_2 \leq 3$
   $\qquad\qquad x_2 + 3x_3 \leq 5$
   $\qquad\qquad x_1, x_2\ x_3 \geq 0$.
(10 Marks)

3 a. Use dual simplex method to solve the LPP :
   Maximize $z = -2x_1 - x_3$
   Subject to $x_1 + x_2 - x_3 \geq 5$
   $\qquad\qquad x_1 - 2x_2 + 4x_3 \geq 8$
   $\qquad\qquad x_1\ x_2\ x_3 \geq 0$.
(10 Marks)

   b. Use revised simplex method to solve the following LPP :
   maximize $z = x_1 + x_2$
   subject to $2x_1 + 5x_2 \leq 6$
   $\qquad\qquad x_1 + x_2 \geq 2$
   $\qquad\qquad x_1, x_2 \geq 0$.
(10 Marks)

4   a. Five men are available to do five different jobs. Form past records, the time (in hours) that each man takes to do each job is known and given in the following table.   **(10 Marks)**

		I	II	III	IV	V
	A	2	9	2	7	1
	B	6	8	7	6	1
Man	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

   b. Solve the travelling – salesman problem given by the following data :
   $C_{12} = 20$ $C_{13} = 4$ $C_{14} = 10$ $C_{23} = 5$ $C_{34} = 6$ $C_{25} = 10$ $C_{35} = 6$ $C_{45} = 20$
   Where $C_{ij} = C_{ji}$ and there is no route between cities i and j if the value for C_{ij} is not shown.   **(10 Marks)**

PART – B

5   a. Explain stepping stone method in problems.   **(05 Marks)**
   b. Find the basic feasible solution of the following transportation problem by NWCR. Also find the optimal transportation plan.

	1	2	3	4	5	Available
A	4	3	1	2	6	80
B	5	2	3	4	5	60
C	3	5	6	3	2	40
D	2	4	4	5	3	20
Required	60	60	30	40	10	200 Total

   (15 Marks)

6   a. Explain the characteristics of game theory.   **(05 Marks)**
   b. Reduce the following game by dominance property and solve it.   **(07 Marks)**

		Player B			
		I	II	III	IV
	I	3	2	4	0
Player A	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

   c. Solve the following game by graphical method.

		B		
		I y_1	II y_2	III y_3
A	x_1 I	1	3	11
	$1-x_1$ II	8	5	2

   (08 Marks)

7 a. Explain the basic steps in PERT – CPM. (06 Marks)

   b. A project has the following schedule.

Activity	Time in weeks	Activity	Time in weeks
(1 – 2)	4	5 – 7	8
(1 – 3)	1	6 – 8	1
(2 – 4)	1	7 – 8	2
(3 – 4)	1	8 – 9	1
(3 – 5)	6	8 – 10	8
(4 – 9)	5	9 – 10	7
(5 – 6)	4	–	–

   Construct PERT network and compute :
   i) T_E and T_L for each event
   ii) Float for each activity
   iii) Critical path and its duration. (14 Marks)

8 a. Mention the situations for the replacement of models (04 Marks)

   b. The probability P_n of failure just before are n is shown below. If individual replacement cost is Rs. 12.50 and group replacement costs is Rs. 3.00 per item. Find the optimal replacement policy.

n	1	2	3	4	5
P_n	0.1	0.2	0.25	0.3	0.15

(16 Marks)

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