Seventh Semester B.E. Degree Examination, June/July 2018
Operations Research

Time: 3 hrs.　　　　　　　　　　　　　　　　　　　　Max. Marks: 100

Note: *1. Answer FIVE full questions, selecting*
atleast TWO questions from each part.
2. Missing data, if any, may be suitably assumed.

PART – A

1   a.   Enumerate different types of models of OR and explain in brief.　　(06 Marks)
    b.   Explain different phases of OR study.　　(04 Marks)
    c.   Solve the following problem by graphical method and find optimum value of Z.
         Maximize $Z = 5x_1 + 7x_2$
         Subject to constraints $x_1 + x_2 < 4$
         $$3x_1 + 8x_2 < 24$$
         $$10x_1 + 7x_2 < 35$$
         $$x_1, x_2 > 0.$$　　(10 Marks)

2   a.   Solve the following LPP,
         Maximize $z = 3x_1 + 2x_2$
         Subject to constraints $4x_1 + 3x_2 < 12$
         $$4x_1 + x_2 \le 8$$
         $$4x_1 - x_2 \le 8$$
         $$x_1, x_2 > 0.$$　　(12 Marks)
    b.   Write the dual of following LPP :
         Max $z = 3x_1 - x_2 - x_3$
         Subject to $4x_1 - x_2 < 8$
         $$8x_1 + x_2 + 3x_3 > 12$$
         $$5x_1 - 6x_3 \le 13$$
         $$x_1, x_2, x_3 \ge 0.$$　　(08 Marks)

3   a.   What do you mean by unbalanced transportation problem?　　(04 Marks)
    b.   Solve the following transportation problem and find minimum transportation cost (optimal).

		Destination				
		D_1	D_2	D_3	D_4	Supply
Origins	O_1	6	1	9	3	70
	O_2	11	5	2	8	55
	O_3	10	12	4	7	70
	Demand	85	35	50	45	

(16 Marks)

4 a. There are four jobs to be assigned to the machines. One job could be assigned to one machine. The cost of each job on each machine is given in the following table. Find optimum assignment and the minimum cost (10 Marks)

Machines

Jobs		A	B	C	D	E
	1	4	3	6	2	7
	2	10	12	11	14	16
	3	4	3	2	1	5
	4	8	7	6	9	6

b. Solve the following travelling salesman problem to find minimum travelling time.

To

From		A	B	C	D	E
	A	∞	4	7	3	4
	B	4	∞	6	3	4
	C	7	6	∞	7	5
	D	3	3	7	∞	7
	E	4	4	5	7	∞

(10 Marks)

PART – B

5 a. List out the assumptions made in Johnson's algorithm. (05 Marks)

b. Four jobs 1, 2, 3 and 4 are to be processed on each of five machines A, B, C, D and E in the order ABCDE. Find the total minimum elapsed time if no passing of Jobs is permitted. Also find the idle time for each machine. (15 Marks)

6 a. Explain :
   i) two person zero from game
   ii) saddle point. (04 Marks)
b. Solve the following game and hence find value of game. (06 Marks)

	B_1	B_2	B_3	B_4
A_1	–5	2	0	7
A_2	5	6	4	8
A_3	4	0	2	–3

c. Solve the following zero sum game and find valve of game.

Player B

Player A	5	–10	9	0
	6	7	8	1
	8	7	15	1
	3	4	–1	4

(10 Marks)

7 a. Give the classification of queuing models and explain in brief. **(06 Marks)**
   b. Customer arrive at a one window drive in bank according to Poisons distribution with mean 10 per hour. Service time per customer is exponential with mean 5 minutes. The space in front of the window including that for serviced car accommodate a maximum of 3 cars. others can wait outside this space
      i) What is the probability that an arriving customer can drive directly to the space in front of the window?
      ii) What is the probability that an arriving customer will have to wait outside the indicated space?
      iii) How long is an arriving customer expected to wait before starting service? **(10 Marks)**
   c. What are the basic characteristics of a queuing system? **(04 Marks)**

8 a. Distinguish between CPM and PERT. **(04 Marks)**
   b. Define network, activity, event. **(06 Marks)**
   c. The activities and the duration are given in the following table. Draw the network and find critical path and the total project duration.

Activity	1 – 2	1 – 3	2 – 3	2 – 5	3 – 4	3 – 6	4 – 5	4 – 6	5 – 6	6 – 7
Duration	15	15	3	5	8	12	1	14	3	14

(10 Marks)

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