Paper Id: 140725 Roll No:

B. TECH
(SEM-VII) THEORY EXAMINATION 2019-20
OPERATIONS RESEARCH

Time: 3 Hours ***Total Marks: 70***

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

a.	What is sensitivity analysis?
b.	What are the limitations of graphical method?
c.	How would you deal with the assignment problems, where the objective function is of maximization type?
d.	What are the customer's behaviors in queuing system?
e.	Explain the Dummy Activity in network diagram.
f.	Write short note on Johnson Algorithm for n jobs and 3 machines.
g.	How will you control the inventories of a manufacturing organization?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

a. Solve the following linear programming problem by Simplex method:

$$\text{Maximize } z = 8x + 16y$$
$$\text{subject to } x + y \le 200$$
$$y \le 125$$
$$3x + 6y \le 900$$
$$\text{and } x, y \ge 0$$

b. Find the optimal solution of the following transportation problem in which cell entries represent unit costs.

From	To			Available
	W1	W2	W3	
F1	4	14	8	10
F2	6	6	2	16
F3	10	8	14	14
F4	2	12	4	28
Required	14	18	36	

c. Describe the two person zero-sum game. Mention its basic assumptions. Solve the following two person zero-sum game:

		Player B		
Player A		I	II	III
	I	10	5	-2
	II	6	7	3
	III	4	8	4

d. Discuss the various inventory costs associated with the organization taking suitable examples and Why?

e. A certain project is composed of nine activities whose time estimates are given below:

Activity	1–2	1–3	1–4	2–5	3–5	4–6	5–6	6–7	5–7
Duration	1	3	2	1	3	2	4	6	3

Draw the project network and find out the critical path.

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SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) A company has two grades of inspectors, I and II to undertake quality control inspection. At least 1,500 pieces must be inspected in an 8-hour day. Grade I inspector can check 20 pieces in an hour with an accuracy of 96%. Grade II inspector can check 14 pieces an hour with an accuracy of 92%. Wages of grade I inspector are Rs 5 per hour while those of grade II inspector are Rs 4 per hour. Any error made by an inspector costs Rs 3 to the company. If there are, in all, 10 grade I inspectors and 15 grade II inspectors in the company, find the optimal assignment of inspectors that minimizes the daily inspection cost.

(b) Write the dual of the following problem

Minimize $Z = 20x_1 + 16x_2$

Subject to
$x_1 + x_2 \geq 12$
$2x_1 + x_2 \geq 17$
$2x_1 \geq 5$
$x_2 \geq 6$

4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Assign four trucks 1, 2, 3, and 4 to vacant spaces A, B, C, D and E So that the distance travelled is minimized.

		Truck			
		1	2	3	4
	A	9	14	19	15
Spaces	*B*	7	17	20	19
	C	9	18	21	18
	D	10	12	18	19
	E	10	15	21	16

(b) Using Least- Cost method to solve initial solution of the following problem:

		Destination		
Source	D_1	D_2	D_3	*Capacity*
S_1	10	13	6	10
S_2	16	7	13	12
S_3	8	22	2	8
Demand	6	11	13	30

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) A readymade garment manufacture has to process 7 items through two stages of production viz., cutting and sewing. The time taken for each of these items at the different stages is given below in appropriate units:

Item	1	2	3	4	5	6
Cutting Time	30	120	50	20	90	110
Sewing Time	80	100	90	60	30	10

Find the order in which these items are to be processed through these stages so as to minimize the total processing time. Also calculate total elapsed time and idle times.

(b) The following matrix represents player A's pay-off in a two person zero-sum game:

	Player B			
Player A		I	II	III
	I	20	40	-80
	II	0	15	-20
	III	90	20	50

Find the optimal strategies for the two players and also the value of the game.

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Derive a single period probabilistic inventory model with instantaneous and continuous demand and no set up cost.

(b) What is Monte Carlo Simulation? Discuss in brief.

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) A project has the following characteristics:

Activity	**Preceding Activity**	**Expected Completion Time (in weeks)**	**Activity**	**Preceding Activity**	**Expected Completion Time (in weeks)**
A	None	5	H	B	9
B	A	2	I	G, E	1
C	A	6	J	G	2
D	B	12	K	F, I, J	3
E	D	10	L	K	9
F	D	9	M	H, G	7
G	D	5	N	M	8

(i) Draw a PERT network for this project.

Find the various paths and the critical path as well as the project completion time.

(b) If in a particular single server system, the arrival rate λ =5 per hour and service, μ=8 per hour assume the conditions for use of the single channel queuing model. Find out:

(i) The probability that the server is idle.
(ii) The probability that there are at least two customers in the system.
(iii) Expected time that a customer is in the queue.