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

Time: 3 Hours   *Total Marks: 100*

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

SECTION A

1. **Attempt *all* questions in brief.**   **2 x 10 = 20**
   a) Define operations research.
   b) Write a note on slack and surplus variables in linear programming.
   c) Differentiate between pure and mixed strategies.
   d) Define artificial variables.
   e) What is slack and float?
   f) Define degeneracy in transportation problem.
   g) What is a dummy activity? Why do we need dummy activities?
   h) What is meant by optimal solution?
   i) Distinguish between assignment and allocation problem.
   j) List all the cost associated with inventories.

SECTION B

2. **Attempt any *three* of the following:**   **10 x 3 = 30**
   a) What do you mean by Operations Research? Discuss its scope as well as limitations.
   b) Write mathematical formulation of transportation problems.
   c) Discuss the concept of network analysis. Explain the PERT & CPM models and their utility.
   d) What do you mean by queueing models? Why do arrival and services follow the Poisson and Exponential distribution respectively?
   e) Define Inventory Control. Explain in various techniques of inventory control.

SECTION C

3. **Attempt any *one* part of the following:**   **10 x 1 = 10**
   a) Discuss in detail the methodology of Operations Research.
   b) Solve the following LPP graphically:
   Minimize $Z = 5x_1 + 8x_2$
   Subject to the constraints:
   $x_1 \leq 4$; $x_2 \geq 2$; $x_1 + x_2 = 5$; $x_1, x_2 \geq 0$

4. **Attempt any *one* part of the following:**   **10 x 1 = 10**
   a) Find the Total cost using North-west corner method. Also find the optimal assignment.

	W1	W2	W3	W4	Capacity
F1	95	105	80	15	12
F2	115	180	40	30	7
F3	195	180	95	70	5
Requirements	5	4	4	11	

   b) What is the unbalanced Assignment problem? How is it solved by the Hungarian method?

5. **Attempt any *one* part of the following:**   **10 x 1 = 10**
    a) How PERT and CPM techniques useful in managerial decision making?
    b) Draw a network diagram on the basis of following data:

Activity	Duration (days)	Activity	Duration (days)
1-2	2	4-8	8
1-4	2	5-6	4
1-7	1	6-9	3
2-3	4	7-8	3
3-6	1	8-9	5
4-5	5	9-10	2

6. **Attempt any *one* part of the following:**   **10 x 1 = 10**
    a) Obtain the optimal strategies for both persons and the value of the game for zero-sum two-person game whose payoff matrix is given below:

3	2	4	0
2	4	4	2
4	2	4	0
0	4	0	8

    b) Jobs arrival at a workstation in a manufacturing plant is in a Poisson fashion at an average rate of five per hour. The time to machine one job is an exponential distribution with a mean time of 20 minutes. What is the expected time a job has to wait at the workstation? What will be the average number of jobs waiting at the workstation at any time? What is the probability that there will be more than four jobs?

7. **Attempt any *one* part of the following:**   **10 x 1 = 10**
    a) What is meant by Economic Ordered Quantity? Discuss its utility in Inventory Control.
    b) A truck owner finds from his past records that the maintenance cost per year of a truck whose purchase price is Rs.8000, are given below:

Year	1	2	3	4	5	6	7	8
Maintenance Cost (in Rs)	1000	1300	1700	2200	2900	3800	4800	6000
Resale value (in Rs)	4000	2000	1200	600	500	400	400	400

    Determine at what time it is profitable to replace the truck?