Roll No. ☐☐☐☐☐☐☐☐☐☐☐   **Total No. of Pages : 02**

Total No. of Questions : 09

B.Tech.(ME) (O.E. 2011 Onwards)   (Sem.–7,8)

OPERATION RESEARCH

Subject Code : IT-310

Paper ID : [A3297]

Time : 3 Hrs.   **Max. Marks : 60**

INSTRUCTIONS TO CANDIDATES :
1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. **Answer briefly :**

   a) Define key row and degeneracy.

   b) What are the limitations of graphical method?

   c) What do you understand by balanced and unbalanced transportation problem?

   d) Write the applications of Simulation.

   e) What are the applications of queuing theory?

   f) Define System length in queuing model.

   g) Write two limitations of linear programming.

   h) Define float and slack.

   i) Define key column.

   j) Name any four mathematical models.

SECTION-B

2. Using Graphical Method, Find the maximum value of :

   $Z = 2X_1 + X_2$

   subject to: $X_1 + 2X_2 \le 10$;

   $\qquad X_1 + X_2 \le 6$;

   $\qquad X_1 - X_2 \le 2$;

   $\qquad X_1 - 2X_2 \le 1$;

   $\qquad X_1, X_2 \ge 0$

3. Write a note on Integer Programming Model.

4. Find the optimum solution to the problem in which the cells contain the transportation cost in rupees

	W1	W2	W3	W4	W5	Available
F1	7	6	4	5	9	40
F2	8	5	6	7	8	30
F3	6	8	9	6	5	20
F4	5	7	7	8	6	10
Required	30	30	1 5	20	5	

5. On an average, 6 customers reach a telephone booth every hour to make calls. Determine the probability that exactly 4 customers will reach in 30 minutes period, assuming that arrival follows poisson distribution.

6. What are the steps in Goal Programming Model Formulation?

SECTION-C

7. Use Simplex method to solve :

   Maximize $Z = 2X_1 + 5X_2$

   Subject to $X_1 + 4X_2 \leq 24$

   $3X_1 + X_2 \leq 21$

   $X_1 + X_2 \geq 9$

   $X_1, X_2 \geq 0$.

8. A company has one surplus truck in each of the cities A, B, C, D and E and one deficient truck in each of the cities 1, 2, 3, 4, 5 and 6. The distance between the cities in kilometers is shown below. Find the assignment of trucks from cities in surplus to cities in deficit so that the total distance covered by vehicles is minimum.

	1	2	3	4	5	6
A	12	10	15	22	18	8
B	10	18	25	15	16	12
C	11	10	3	8	5	9
D	6	14	10	13	13	12
E	8	12	11	7	13	10

9. Explain the similarities and differences between CPM and PERT.