

Roll No.

24478

B. Tech. 7th Sem.

**(Mechanical Engineering) VII
Examination – December, 2013**

OPERATION RESEARCH

Paper : ME-405-F

Time : Three hours]

[Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any *five* questions taking at least *one* question from each Section. Question No. 1 is *compulsory*.

1. (a) Discuss the various phases in solving OR problem.
- (b) Prove that the dual of the dual of the given primal is primal.
- (c) Indicate the difference between decision making under risk and uncertainty in statistical decision theory. PERT calculations yield a project length of 60 weeks with variance of 9. Within how many weeks would.

- (d) you expect the project to be completed with probability of 0.99 ? 5 × 4 = 20

SECTION – A

2. State the different types of models used in operation research. Explain briefly the general methods for solving these OR models. 20
3. Minimize $Z = 2x_1 + 3x_2$;
 Subject to constraints :
 $x_1 + x_2 \geq 5$; $x_1 + 2x_2 \geq 6$; $x_1, x_2 \geq 0$. 20

SECTION – B

4. Find an initial basic feasible solution to the following transportation problem using Vogel's Approximation Method : 20

| | | WAREHOUSE | | | | CAPACITY |
|-------------|----|-----------|----|----|----|----------|
| | | W1 | W2 | W3 | W4 | |
| FACTORY | F1 | 19 | 30 | 50 | 10 | 7 |
| | F2 | 70 | 30 | 40 | 60 | 9 |
| | F3 | 40 | 8 | 70 | 20 | 18 |
| Requirement | | 5 | 8 | 7 | 14 | |

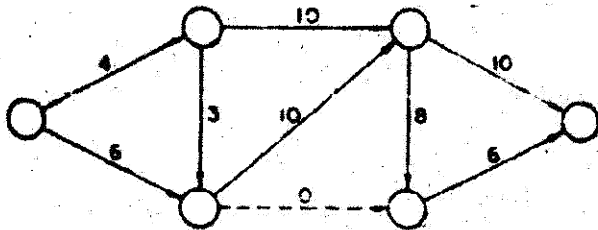
5. Use dual simplex method to : 20
- Minimize $Z = 2x_1 + x_2$;
 Subject to constraints :
 $3x_1 + x_2 \geq 3$; $4x_1 + 3x_2 \geq 6$; $x_1 + 2x_2 \leq 3$; $x_1, x_2 \geq 0$.

SECTION - C

6. A firm is engaged in both shipping and receiving activities. The management is always interested in improving the efficiency of new innovations in loading and unloading procedures. The arrival distribution of trucks is found to be Poisson with arrival rate of 3 trucks per hour. The service time distribution is exponential with unloading rate of 4 trucks per hour. Determine : 20

- (i) Expected number of trucks in the queue.
- (ii) Expected waiting time of the trucks in the queue.
- (iii) Probability that the loading and unloading dock and workers will be idle.
- (iv) What reductions in waiting time are possible if loading and unloading is standardized ?

7. For the network shown in figure, the scheduled completion time is 32 days. Determine the slack times for the events and identify the critical path. 20



SECTION - D

8. Explain how Statistical Analysis can be helpful to business managers in decision - making under uncertainty.
9. Use the mixed congruential method to generate the following sequences of random numbers:

A sequence of five two-digit numbers, such that

$$r_{i+1} = (21 + r_i \cdot 53) \pmod{100}, \text{ take } r_0 = 46.$$