

Roll No. ....

**24478**

**B. Tech. 7th Semester (ME)**

**Examination – May, 2015**

**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) What are the essential characteristics of a linear programming model ?
- (b) Explain duality theory of linear programming.
- (c) Explain :
  - (i) Action Space
  - (ii) Payoff Table
  - (iii) Opportunity Loss.
- (d) Define the physical meaning of the term :
  - (i) Total Float,

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P. T. O.

- (ii) Free Float
- (iii) Independent float.

$$5 \times 4 = 20$$

**SECTION - A**

2. Define a scientific model. Discuss in detail the three types of models with special emphasis on the important logical properties and the relationships the three types bear to each other and to model entities. 20

3. Maximize :  $z = 3x_1 - x_2$ ; 20

Subject to :

$$2x_1 + x_2 \geq 2;$$

$$x_1 + 3x_2 \leq 3;$$

$$x_2 \leq 4;$$

$$\text{and } x_j \geq 0; j = 1, 2$$

**SECTION - B**

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

	Destination				Availability	
	1	2	3	4		
Origin	A	7	2	5	5	30
	B	4	4	6	5	15
	C	5	3	3	2	10
	D	4	-1	4	2	20
Requirement	20	25	15	15		

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5. Use dual simplex method to :

$$\text{Maximize : } z = 20x_1 + 16x_2;$$

20

Subject to :

$$x_1 + x_2 \geq 12;$$

$$2x_1 + x_2 \geq 17;$$

$$x_1 \geq 2.5; \quad x_2 \geq 6;$$

$$\text{and } x_1, x_2 \geq 0$$

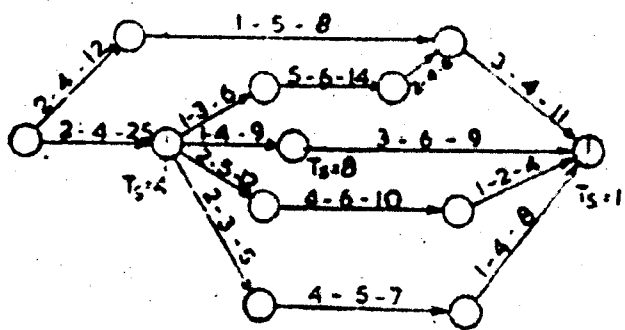
**SECTION - C**

6. A company manufacturing cold drinks uses a capping machine which caps bottles at the rate of 1 every 2 seconds. The bottles arrive at the rate of 1 bottle every 4 seconds. If in the beginning, there are 20 bottles to be capped, how much time is required to service the bottles that are waiting ? 20

7. For the PERT network shown in figure, the activity times (in hours) are given along the arrows. The schedule times for some important events are given along the nodes. Determine the critical path and the probabilities of meeting the scheduled dates for the specified events. Tabulate the results and determine the slacks. 20

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P. T. O.



**SECTION - D**

8. What is meant by Statistical Decision Analysis ? How is it different from other methods used in decision-making ? Describe some methods which are useful in decision - making under uncertainty. 20

9. Use the mixed congruential method to generate the following sequences of random numbers. A sequence of five random numbers between 0 and 31, such that :  
 $r_{n+1} = (9r_n + 15) \pmod{32}$ , take  $r_0 = 12$