

## III B. Tech II Semester Supplementary Examinations, November/December – 2016

**OPERATIONS RESEARCH**

(Mechanical Engineering)

Time: 3 hours

Maximum Marks: 70

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)  
 2. Answering the question in **Part-A** is compulsory  
 3. Answer any **THREE** Questions from **Part-B**

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**PART -A**

- 1 a) Explain fundamental principle of duality. [3M]  
 b) Explain what you mean by flow shop sequencing. [4M]  
 c) Explain the applications of group replacement. [4M]  
 d) What are the characteristics of game theory? [4M]  
 e) What are the different types of inventories? Briefly explain them. [4M]  
 f) What is simulation and what are the different types of it? [3M]

**PART -B**

- 2 a) Solve by Big –M method [10M]  
 Minimize Z  $2x_1 + x_2$   
 Subject to  $3x_1 + x_2 = 3$   
 $4x_1 + 3x_2 \geq 6$   
 $x_1 + 2x_2 \leq 4$   
 $x_1, x_2 \geq 0$
- b) State and discuss about the characteristics of operation research. [6M]
- 3 a) Solve the following transportation problem. [10M]

				to			
		D1	D2	D3	D4	D5	availability
	A	4	1	2	6	9	100
from	B	6	4	3	5	7	120
	C	5	2	6	4	8	120
	requirements	40	50	70	90	90	

- b) We have five jobs, each of which has to go through the machines A and B in the order AB. Processing times are given in the table below. [6M]

Job	A <sub>i</sub>	B <sub>i</sub>
1	5	2
2	1	6
3	9	7
4	3	8
5	10	4

Find the sequence and total make span?

1 of 2



- 4 a) Machine A costs Rs 45,000 and the operating costs are estimated at Rs 1000 for the first year, increasing by Rs 10,000 per year in the second and subsequent years. Machine B costs Rs 50,000 and operating costs are Rs 2000 for the first year, increasing by Rs 4000 in the second and subsequent years. If you have a machine of type A, should we replace with B? If so when? Assume that both machines have no resale value and future costs are not discounted. [10M]

b) What is meant by time value of money? Explain. [6M]

- 5 a) Using dominance principle to simplify the rectangular game with the following pay of matrix, and solve it graphically: [8M]

		Player B			
		I	II	III	IV
Player A	I	18	4	6	4
	II	6	2	13	7
	III	11	5	17	3
	IV	7	6	12	2

- b) In a railway station only one train is handled at a time. The railway yard is sufficient for two trains to wait while others are given signal to leave the station. Trains arrive at a station at an average of 6 per hour and the railway station can handle them at an average rate of 12 per hour. Assuming Poisson arrival and exponential service distribution, find the steady state probabilities of the various number of trains in the system. Also find the average number of trains in the system. [8M]

- 6 a) Find the order quantity for a product for which the price breaks are as follows [10M]

Quantity (units)	Unit cost (Rs)
$0 < Q_1 < 500$	10.00
$500 \leq Q_2 < 750$	9.25
$Q_3 \geq 750$	8.75

The monthly demand for the product is 400 units. The storage cost is 2 percent of the unit cost and the cost of ordering is Rs350.

b) Explain VED analysis with example. [6M]

- 7 a) Find the non-negative real numbers such that sum of squares of these numbers is minimum with restriction that their sum is not less than 75. Show the stages in dynamic programming to solve the problem. [10M]

b) Explain the phases of simulation. [6M]

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