

Register Number:

Name of the Candidate:

**B.Sc. DEGREE EXAMINATION, May 2015****(MATHEMATICS)****(THIRD YEAR)****(PART - III)****740. OPERATIONS RESEARCH**

Time: Three hours

Maximum: 100 marks

**Answer any FIVE questions****(5 × 20 = 100)**

1. a) A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes namely suiting's, shirting's, and woollens yielding a profit of ₹ 2, ₹4 and ₹3 per meter respectively. One meter suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing. Similarly one meter of shirting requires 4 minutes in weaving, 3 minutes in each department. In a week, total run time of each department is 60, 40 and 80 hours for weaving processing and packing department respectively. Formulate L.P.P. model.  
b) Solve the LPP graphically  
Max  $Z=3x_1+2x_2$   
Subject to  
 $-2x_1+x_2=1$   
 $x_1 \geq 3$   
 $x_1+x_2 \leq 3$   
 $x_1, x_2 \geq 0$
2. Using simplex method solve the following LPP  
Max  $Z=x_2-3x_3+2x_5$   
Subject to  
 $3x_2-x_3+2x_5 \leq 7$   
 $-2x_2+4x_3 \leq 12$   
 $-4x_2+3x_3+8x_5 \leq 10$   
 $x_2, x_3, x_5 \geq 0$
3. Use two-phase method to  
Maximize  $Z=3x_1-x_2$   
Subject to  
 $2x_1+x_2 \geq 2$   
 $x_1+3x_2 \leq 2$   
 $x_2 \leq 4$   
 $x_1, x_2 \geq 0$
4. a) Obtain the dual of the following L.P.P.  
Maximize  $Z=2x_1+x_2$   
Subject to  $x_1+5x_2 \leq 10$   
 $x_1+3x_2 \geq 6$   
 $2x_1+2x_2 \leq 8; x_2 \geq 0$  and  $x_1$  unrestricted

- b) Solve the following LPP using dual simplex method

$$\text{Minimize } Z=2x_1+x_2$$

Subject to

$$3x_1+x_2 \geq 3$$

$$4x_1+3x_2 \geq 6$$

$$x_1+2x_2 \leq 3$$

$$x_1, x_2 \geq 0$$

5. Solve the following transportation problem by using north-west corner method

		To					Availability
		I	II	III	IV	V	
From	A	2	4	6	8	9	20
	B	2	10	1	5	8	30
	C	7	11	20	40	3	15
	D	2	1	9	14	16	13
Requirement		40	6	8	18	6	

6. Solve the following assignment problem

	1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

7. Find the optimal sequences, the total minimum elapsed time and idle time for each machines

Task:	A	B	C	D	E	F	G	H	I
Machine 1:	2	5	4	9	6	8	7	5	4
Machine 2:	6	8	7	4	3	9	3	4	11

8. A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for one year is ₹ 2 and the set-up cost of a production run is ₹1800. How frequently should production run be made?
9. A manufacturer is offered machines A and B. A is priced at ₹ 5000 and running costs are estimated at ₹800 for each of the first 5 years, increasing by 200 per year in the 6<sup>th</sup> and subsequent years. Machine B, which has the same capacity as A costs ₹2500 but will have running costs of ₹1200 per year for six years, increasing by ₹200 per year thereafter. If the rate of interest is 10% per year, which machine should be purchased. Assume that the machines have no resale price.
10. a) Explain about the systems with component in series and systems with parallel components.
- b) The mean life of a component is equal to 20 hours. It is proposed to increase reliability by 25% for a mission time equal to 40 hours. What should be the mean life of the improved design assuming exponential failure characteristics?

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