FACULTY OF ENGINEERING

B.E. 4/4 (M/P) I – Semester (Main) Examination, Nov. / Dec. 2012

Subject : Operations Research

Time : 3 hours   Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (10 x 2.5 = 25 Marks)

1. What areas of operations Research have made a significant impact on decision making process.

2. Define and illustrate graphically the following terms :

   i) Optimal solution   ii) Feasible solution   iii) Unbounded solution

3. Illustrate with examples the use of slack and surplus variables in linear programming problem.

4. Show that dual of a dual linear programming problem is the primal problem.

5. What do you mean by degeneracy in transportation model?

6. Assignment model is a special case of transportation model. Discuss.

7. How do you solve a game, when saddle point does not exist?

8. What are the assumptions of the common queuing models?

9. What do you understand by the sequencing problem? Explain the principal assumptions made in the problem.

10. What is the difference between group replacement and individual replacement?

PART – B (5 x 10 = 50 Marks)

11. A certain company produces tea trays and ash trays out of sheet metal. Following data is given on capacity availability and economics of each product.

Dept.	Time taken for		Available time
	Ash tray	Tea tray	
Stamping	10 sec	20 sec	30,000 sec
Forming	15 sec	5 sec	30,000 sec

Determine the optimum production schedule. Each ash tray contributes Rs.20 to the gross profit and each tea tray contributes Rs.30 to the gross profit. Total daily fixed costs amount to Rs.45,000.

Solve the problem graphically. What is the maximum net profit per day at the optimum production level, including the effect of fixed cost.

12. Solve the following LP :

   Maximize $z = 2x_1 + 5x_2 + 7x_3$

   Subject to $= 3x_1 + 2x_2 + 4x_3 \leq 100, \; x_1 + 4x_2 + 2x_3 \leq 100$

   $x_1 + x_2 + 3x_3 \leq 100, \; x_1, x_2, x_3 \geq 0$

13. A company having plants at P, Q, and R supplies to the warehouses at X, Y and Z. Monthly requirements at warehouses are 55, 65 and 75 and monthly capacities at plants are 75, 95 and 25 respectively. Unit shipping costs are as follows :

	X	Y	Z
P	18	21	15
Q	16	22	26
R	16	15	16

Determine the initial solution using VAM and check whether the obtained solution is optimal? If not find the optimal solution.

14. A project work consists of four major jobs for which four contractors have submitted tenders. The tender amounts quoted in thousand of rupees are given in the matrix as

		Jobs			
		J_1	J_2	J_3	J_4
	C_1	15	29	35	20
Contractors	C_2	21	27	33	17
	C_3	17	25	37	15
	C_4	14	31	39	21

Find the assignment which minimizes total cost of the project.

15. a) Define time value of money. Calculate the present value after 10 years of interest rate is 8%.

b) The maintenance cost and re-sale value per year of a machine whose purchase price is Rs.7,500/- is given below.

Year	1	2	3	4	5	6	7	8
Maintenance cost (Rs.)	800	1200	1700	2000	2600	3500	4600	5800
Re-sale value	3500	2000	1100	600	600	400	400	400

when should the machine be replaced.

16. a) Explain the procedure to solve 2 jobs and m machines using graphical method. (4)

b) A flow shop has two machines. The processing time (M min.) is given as (6)

Job	A	B	C	D	E	F
M/c 1	2	3	7	9	6	5
M/c 2	10	8	5	1	4	3

Determine the optimal make span.

17. a) Explain Kendall's notation used in queuing models. (4)

b) A manager has to decide to hire one of the two repairmen A and B. On an average three machine breakdown every hour and breakdown follows Poisson distributor. Non-productive time of a machine is considered to cost Rs.15 per hour. Mechanic 'A' charges Rs.20 per hour and repairs the machines at the rate of 6 machines/hr, while mechanic 'B' charges Rs.12 per hour and repairs the machines at the rate of 4 machines/hr. The service follows exponential distributor. Which repairman should be hired? (6)

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