

Mech

Total No. of Questions: 4

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College of Engineering, Pune
End Semester Examination- 2012-13

Subject: (ME 318) Operations Research

Class: T.Y. B. Tech. (Mechanical Engg)

Time: 2 p.m. to 5 p.m.

[Max. Marks: 50]

Date: 28th April 2013

Instructions to candidates:

1. Question No. 1 is compulsory and answer any two questions from the remaining.
2. Figures to right indicate full marks
3. Assume necessary assumptions and data if required.
4. Use of non-programmable electronic calculator is allowed.

- Q. No. 1**
- a** A company wishes to plan its advertising strategy. There are two media under consideration call them magazine I and II respectively. Magazine I has potential to reach 2,000 customers and magazine II has a reach of 3,000 customers. The cost per page of advertizing is Rs 400 and Rs 600 in magazine I and II respectively. The firm has monthly budget of Rs 6,000. There is an important requirement that the total reach of the income group under Rs 20,000 per annum should not exceed 4,000 potential customers. The reach in magazines I and II for this income group is 400 and 200 potential customers. How many pages in each magazine should be brought in to maximize total reach?
- i) Formulate the above as linear programming problem 3
 - ii) Solve the problem by simplex and graphical method 5
 - iii) Obtain the dual for the same 2
- b** With the help of given information below
- i) Construct the network diagram 2
 - ii) Identify critical path by calculating earliest start time (E) and latest finish time (L) for each node 2
 - iii) Also verify the results through tabular calculations (by calculating total slack) 2

Activity	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Time (Days)	15	15	3	5	8	12	1	14	3	14

- c** State the principles of dominance for row and column. 2

Please turn over

- d Explain the significance of "Economic order quantity". 2

- Q. No. 2 a Use any artificial variable technique to solve

$$\text{Max } z = 3x_1 - x_2$$

Subjected to the constraints

$$2x_1 + x_2 \geq 2$$

$$x_1 + 3x_2 \leq 3$$

$$x_2 \leq 4$$

$$x_1, x_2 \geq 0$$

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- b A branch of State Bank of India has only one typist. Since the typing work varies in length (number of pages to be typed), the typing rate is randomly distributed approximating a Poisson distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8-hour work day. If the typewriter is valued at Rs. 100 per hour, calculate

- i) Equipment utilization
- ii) The percent time that an arriving letter has to wait.
- iii) Average waiting time in the system
- iv) Average cost due to waiting on the part of typewriter i.e. it remaining idle

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- c Write short note on "Crashing of the network". 3

- Q. No.3 a Reduce the game by using principles of dominance and solve

		Player B					
		I	II	III	IV	V	VI
Player A	1	4	2	0	2	1	1
	2	4	3	1	3	2	2
	3	4	3	7	-5	1	2
	4	4	3	4	-1	2	2
	5	4	3	3	-2	2	2

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- b A project consists of following activities for which the duration and manpower required is identified. Calculate the maximum manpower required.

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Please turn over

Activity	Duration (Days)	Manpower required	Activity	Duration (Days)	Manpower required
1-2	2	5	4-8	5	2
1-3	2	4	5-9	6	8
1-4	0	0	6-9	3	7
2-5	2	2	7-8	4	4
2-6	5	3	8-9	6	3
3-7	4	6			

- c What do you understand by the following
- Transportation problem with degeneracy
 - Unbalanced transportation problem

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- Q. No.4 a A department has four subordinates and four tasks to be performed. The subordinates differ in efficiency and task differs in their difficulty. The estimates of the profit in Rs. each man would earn is given in the effectiveness matrix. How should the tasks be allocated to maximize total earnings?

		Tasks			
		A	B	C	D
Subordinates	I	5	40	20	5
	II	25	35	30	25
	III	15	25	20	10
	IV	15	5	30	15

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- b State and explain the different phases or methodology of operations research.
- c Obtain the optimum sequence so that the total elapsed time can be the minimum. Also calculate utilization for each machine and construct the Gantt chart.

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Books	1	2	3	4	5	6
Printing Time	30	120	50	20	90	110
Binding time	80	100	90	60	30	10

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