

D 34387

(Pages : 3)

Name.....

Reg. No.....



**SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION  
MARCH 2013**

ME 04 605—OPERATIONS RESEARCH

(2004 Scheme)

Time : Three Hours

Maximum : 100 Marks

*Answer all the questions.*

- I. (a) Explain spacing set and convex set.  
(b) Explain the importance of operations research in the decision-making process.  
(c) Define linear programming and state the applications of linear programming.  
(d) What is the degeneracy in L.P. problem ? Explain with an example the method to resolve degeneracy.  
(e) What is an unbalanced assignment problem ? Explain the various steps involved in solving it.  
(f) Briefly explain the limitation of game theory.  
(g) Explain the basic elements of queues.  
(h) State and describe the basic features of dynamic programming problem.

(8 × 5 = 40 marks)

II. (a) Explain the following :

- (i) Linear equality.  
(ii) Lines and hyper planes.  
(iii) Rank.  
(iv) Simultaneous equations.  
(v) Linear dependent.

(15 marks)

*Or*

- (b) A Caterer is to organize garden parties for a week. He needs a total of 160, 120, 60, 90, 110, 100 and 120 fresh napkins during the seven days of the week. Each new napkin costs Rs. 3. He can use soiled napkins after getting them washed from a laundry. Ordinarily, washing charges are Re. 0.6 per napkin and they are returned after four days. However, the laundry also provides express service, at a cost of Re. 1 per napkin, in which case they are returned after two days. Determine the planning schedule the caterer should adopt to buy or send napkins to the laundry so as to minimize the cost.

(15 marks)

**Turn over**

III. (a) Maximize  $Z = 2x_1 + 2x_2 + 4x_3$

subject to

$$2x_1 + x_2 + x_3 \leq 2$$

$$3x_1 + 4x_2 + 2x_3 \geq 8$$

$$x_1, x_2, x_3, x_4 \geq 0.$$

Show that phase I will terminate with zero artificial basic variable. Carry out phase II with zero artificial variable as part of starting basic solution.

(15 marks)

Or

(b) A project work consists of four major jobs for which four contractors have submitted tenders. The tender amounts quoted in lakhs of rupees are given in the matrix below :

Contractor/Job		a	b	c	d
1	...	10	24	30	15
2	...	16	22	28	12
3	...	12	20	32	10
4	...	9	26	34	16

Find the assignment which minimizes the total cost of project.

(15 marks)

IV. (a) Solve the following transportation problem :

		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Availability
O <sub>1</sub>	...	4	7	3	8	2	4
O <sub>2</sub>	...	1	4	7	3	8	7
O <sub>3</sub>	...	7	2	4	7	7	9
O <sub>4</sub>	...	4	8	2	4	7	2
Demand	...	8	3	7	2	2	22

(15 marks)

Or

(b) (i) Explain :

1. Two person zero-sum game.
2. Saddle point.
3. Pure and mixed strategies with reference to game theory.

(6 marks)

- (ii) Solve the following two person-zero-sum game using graphical method.

		<i>Player B</i>	
		$B_1$	$B_1$
<i>Player A</i>	$A_1$	2	-4
	$A_2$	-1	6
	$A_3$	3	5
	$A_4$	4	1
	$A_5$	3	4
	$A_6$	-7	6

(9 marks)

- V. (a) Sunil medicals is manned by three salesmen. Any salesman can provide desired service to any customer. The customers arrive at the counter according to Poisson distribution at an average rate of 30 per hour. The service time is exponential with a mean rate of 3 minutes.
- (i) What fraction of time are all three attendants busy ?
  - (ii) What is the mean number of customers waiting to be attended ?
  - (iii) What average time does a customer spend at the shop ?
  - (iv) What is the probability that a customer has to wait ?

(15 marks)

*Or*

- (b) A man is engaged in buying and selling identical items. He operates from a warehouse that can hold 500 items. Each month he can sell any quantity that he chooses upto the stock at the beginning of the month. Each month, he can buy as much as he wishes for delivery at the end of the month so long as his stock does not exceed 500 items. For the next four months, he has the following error-free forecasts of cost sales prices :

Month ( $i$ )	...	1	2	3	4
Cost ( $C_i$ )	...	27	24	26	28
Sale Price ( $P_i$ )	...	28	25	25	27

If he currently has a stock of 200 units, what quantities should he sell and buy in next four months ? Find the solution using dynamic programming.

(15 marks)

[4 × 15 = 60 marks]