

Date: 19/5/2017.

Exam No: \_\_\_\_\_

**GANPAT UNIVERSITY**  
**B. TECH SEM- VIII (ELECTRICAL)**  
**REGULAR EXAMINATION- APRIL-JUNE 2017**  
**2EE832: Optimization Techniques**

Time: 3 Hrs

TOTAL MARKS: 70

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.  
(2) Figures on right indicate marks.  
(3) Be precise and to the point in answering the descriptive questions.

**SECTION I**

Q.1

- (A) (1) What do you mean by the term "Feasible region"? Why must this be a well-defined boundary for the maximization problem? [04]  
(2) What is infeasible solution, and how does it occur? How is this condition recognized in the graphical method?
- (B) Solve the following LP problem using graphical method. [08]

Maximize  $Z = 2x_1 + x_2$ ,

Subject to

$$x_1 + 2x_2 \leq 10,$$

$$x_1 + x_2 \leq 6,$$

$$x_1 - x_2 \leq 2,$$

$$x_1 - 2x_2 \leq 1,$$

$$x_1, x_2 \geq 0$$

OR

Q.1

- (A) Explain the graphical method of solving an LP Model. [05]  
(B) Solve the following LP problem using graphical method. [07]

Maximize  $Z = -x_1 + 2x_2$ ,

Subject to

$$x_1 - x_2 \leq -1,$$

$$-0.5x_1 + x_2 \leq 2,$$

$$x_1, x_2 \geq 0$$

Q.2

- (A) Discuss the assumptions of proportionality, additivity, continuity, certainty and finite choices in the context of linear programming problems. [04]  
(B) Egg contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and cost 12 paise per gram. Milk contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and costs 20 paise per gram. The daily requirements of vitamin A and vitamin B are 100 units and 120 units respectively. Find the optimal product mix. [07]

	EGG	MILK	Min Requirements
Vitamin A	6	8	100
Vitamin B	7	12	120
Cost	12	20	

OR



Q.2

- (A) (1) What are the essential characteristics of a linear programming model? [04]  
 (2) Why LP Modelling is most widely used?
- (B) The company has daily order commitment for 20 units of products A and a total of 15 units of product B & Formulate this problem as a LP model so as to maximize the total profit. A firm produces an alloy having the following specifications: [07]  
 (i) Specific gravity  $\leq 0.98$ ,  
 (ii) Chromium  $\geq 8\%$ ,  
 (iii) Melting point  $\geq 450^\circ\text{C}$ , Raw materials A, B and C having the properties shown in the table can be used to make the alloy:

Property	Properties of raw material		
	A	B	C
Specific gravity	0.92	0.97	1.04
chromium	7%	13%	16%
Melting point	440°C	490°C	480°C

Costs of the various raw materials per ton are: £90 for A, £280 for B and £40 for C. Formulate the LP Model to find the properties in which A, B and C be used to obtain an alloy of desired properties while the cost the cost of raw materials is minimum.

Q.3 Attempt following questions.

- (A) Explain following term related to queuing model. [06]  
 (1) Meaning (2) Objective (3) Application
- (B) State relation between service and cost related to queuing theory. [06]

## SECTION II

Q.4

- (A) Briefly discuss the characteristics of OR techniques [04]  
 (B) Apply MODI method to obtain optimal solution of transportation problem using the data given in below table: (Use Vogel's approximation method for initial feasible basic solution) [08]

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
A	3	1	7	4	250
B	2	6	5	9	350
C	8	3	3	2	400
<b>Demand</b>	200	300	350	150	

OR

Q.4

- (A) Explain Modified distribution method for finding optimal solution for a transportation problem. [06]
- (B) Determine the initial basic feasible solution to the following transportation problem by using vogel's approximation method. [06]

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
S1	1	2	1	4	30
S2	3	3	2	1	30
S3	4	2	5	9	40
<b>Demand</b>	20	40	30	10	

Q.5

- (A) What is assignment problem? Give two applications. [05]  
 (B) A department of a company has five employees with the five jobs to be performed. [06]  
 The time (in hours) that each man tasks to perform each job is given in the effectiveness matrix

	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>
<b>A</b>	10	5	13	15	16
<b>B</b>	3	9	18	13	6
<b>C</b>	10	7	2	2	2
<b>D</b>	7	11	9	7	12
<b>E</b>	7	9	10	4	12

How should the jobs be allocated, one per employee, so as to minimize the total Man-hours?

OR

Q.5

- (A) Give the mathematical formulation of an assignment problem. How does it differs [05]  
 from a transportation problem?  
 (B) A departmental head has four subordinates and four tasks to be performed. The [06]  
 subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His  
 estimates of the times that each man would take to perform each task is given in the  
 matrix below:

	<b>Tasks</b>			
	<b>I</b>	<b>II</b>	<b>III</b>	<b>IV</b>
<b>A</b>	8	26	17	11
<b>B</b>	13	28	4	26
<b>C</b>	38	19	18	15
<b>D</b>	19	26	24	10

How should the tasks be allotted to subordinates so as to minimize the total man-hours?

Q.6 Attempt following questions.

- (A) Write the procedural steps of Hungarian method for assignment problem. [06]  
 (B) What are the characteristics and limitations of OR techniques? [06]

END OF PAPER