

GANPAT UNIVERSITY
B.TECH SEM-VIII (ELECTRICAL)
REGULAR EXAMINATION APRIL-JUNE 2016
2EE832: OPTIMIZATION TECHNIQUES

Time: 3 Hours

Total Marks:-70

- Instructions:** - 1. Attempt all questions.
 2. Make suitable assumptions wherever necessary.
 3. Figures to the right indicate full marks.

SECTION-I

- Q:1** (A) Discuss the different scopes of operations research in different areas. (04)
 (B) The ABC Company has been a producer of a picture tubes for television and certain printed circuits for radios. The company has just expanded into full scale production and marketing of AM and AM-FM Radios. It has built a new plant that can operate 48 hours per week. Production of an AM radio in the new plant will require 2 hours and production of an AM-FM radio will require 3 hours. Each AM radio will contribute Rs 40 to profits while an AM-FM radio will contribute Rs 80 to profits. The marketing department, after extensive research has determined that a maximum of 15 AM radios and 10 AM-FM radios can be sold each week.
 (a) Formulate a LP Model to determine the optimum production mix of AM & AM-FM radios that will maximize profits.
 (b) Solve this problem using graphical method.

OR

- Q:1** (A) State & explain characteristics of operations research. (06)
 (B) A Manufacture produces two types of models M1 and M2 each model of the type M1 requires 4 hrs of grinding and 2 hours of polishing, whereas each model of the type M2 requires 2 hours of grinding and 5 hours of polishing. The manufactures have 2 grinders and 3 polishers. Each grinder works 40 hours a week and each polishers works for 60 hours a week. Profit on M1 model is Rs. 3.00 and on Model M2 is Rs 4.00. Whatever produced in week is sold in the market. How should the manufacturer allocate is production capacity to the two types models, so that he may make max in profit in week?

- Q:2** (A) Explain the terms: key decision, objective, alternatives and constrains in the context of linear optimization models by assuming a suitable industrial situation (06)
 (B) Write the dual of the following LP problem: (05)
 minimize $Z = x_1 - x_2 + 3x_3$
 subject to constrains
 $x_1 + x_2 + x_3 \leq 10$,
 $2x_1 - x_2 - x_3 \leq 2$,
 $2x_1 - 2x_2 - 3x_3 \leq 6$
 $x_1, x_2, x_3 \geq 0$

OR

Q:2 (A) Use the simplex method to solve the following LP problem:

$$\text{Maximize } Z = 3x_1 + 5x_2 + 4x_3$$

subject to the constraints

$$2x_1 + 3x_2 \leq 8,$$

$$2x_1 + 5x_3 \leq 10,$$

$$3x_1 + 2x_2 + 4x_3 \leq 15,$$

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

- (B) Egg contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and cost 12 paisa per gram. Milk contains 8 units of vitamin A per gram and 12 units of vitamin B per gram and costs 20 paisa per gram. The daily requirements of vitamin A and vitamin B are 100 units and 120 units respectively. Find the optimal product mix. (03)

	Egg	Milk	Min requirements
Vitamin A	6	8	100
Vitamin B	7	12	120
Cost	12	20	

Q:3 Attempt any three:

- (A) Sketch and explain the flow chart of Gomory's integer programming algorithm (12)

- (B) Maximize $Z = 2x_1 + 3x_2$,

Subject to constraints $x_1 + x_2 \leq 1$;

$$3x_1 + x_2 \leq 4,$$

$$x_1, x_2 \geq 0 \text{ Using graphical method.}$$

- (C) What do you mean by infeasibility and unboundedness in linear programming? Illustrate Graphically
- (D) Explain the terms: key decision, objective, alternatives and constraints in the context of linear optimization models by assuming a suitable industrial situation.

SECTION-II

Q:4 A dairy firm has three plants located in a state. The dairy milk production at each plant is as follows: (12)

Distribution center 1: 7 million liters, Distribution center 2: 5 million liters
 Distribution center 3: 3 million liters Distribution center 4: 2 million liters
 Cost(in hundreds of rupees) of shipping one million litre from each plant to each distribution center is given in the following table:

Distribution Centre

Plants		D ₁	D ₂	D ₃	D ₄
	P ₁	2	3	11	7
	P ₂	1	0	6	1
	P ₃	5	8	15	9

Find the initial basic feasible solution for the given problem by using the Following methods:

- (i) North-West corner method
- (ii) Least cost method
- (iii) Vogel's Approximation method.

OR

Q:4 (A) An automobile dealer wishes to put four different jobs. The repairmen have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The dealer has estimated the number of man-hours that would be required be required for each job-man combination. This is given in matrix form in the following table: (06)

Men	Tasks				
		A	B	C	D
	1	5	3	2	8
	2	7	9	2	6
	3	6	4	5	7
	4	5	7	7	8

Find the optimal assignment that will result in minimum man-hours needed.

(B) Write a procedural steps to find optimal transportation solution by MODI method. (06)

Q:5 (A) Explain Hungarian method for solving assignment problem. (03)

(B) A manufacture has distribution centers at Agra, Allahabad and Kolkata. These centers have availability of 40, 20 and 40 units of his products respectively. His retail outlets A, B, C, and D & E require 25,10,20,30 and 15 units of products. The transportation cost (in rs) per unit between each center outlet is given in below table: determine the optimal shipping cost (08)

	Retail Outlets				
	A	B	C	D	E
Agra	55	30	40	50	40
Allahabad	35	30	100	45	60
Kolkata	40	60	95	35	30

OR

- Q:5 (A) Describe the transportation problem with its general mathematical formulation. (04)
- (B) State the difference between assignment problem and transportation problem. (02)
- (C) A computer center has five expert programmers. The center wants three applications programs to be developed. The head of computer center, after carefully studying the programs to be developed, estimates the time(in minutes) required by the experts for developing the application programs as given in below table. Assign the programmers to the programs in such a way that the minimum total time is taken for developing the programs. (05)

Program	Programmer				
	A	B	C	D	E
I	120	100	80	90	130
II	80	90	110	70	110
III	110	140	120	130	160

Q:6

Attempt the following:

- (A) In a railway marshalling yard, goods train arrive at a rate of 30 trains per day. Assuming that the inter arrival time follows an exponential distribution and the service time (time taken to hump a train) distribution is also exponential with an average of 36 minutes. Calculate:
- (a) expected queue size(line length)
- (b) Probability that queue size exceeds 10.
- (B) What do you understand by queue? what do you understand by (i) Queue discipline (ii) Service process
- (C) Determine an initial basic feasible solution to the following transportation problem by using Least cost method

	D ₁	D ₂	D ₃	D ₄	Supply
O ₁	1	2	1	4	30
O ₂	3	3	2	1	30
O ₃	4	2	5	9	40
Demand	20	40	30	10	

End of Paper
Best of luck