

AMIETE – ET/CS/IT (New Scheme)

Time: 3 Hours

June 2019

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions, answer any FIVE Questions. Selecting THREE questions from part A and TWO questions from part B.
- Any required data not explicitly given, may be suitably assumed and stated.

Q1 Choose the correct or the best alternative in the following: (2 x 10)

- a. Operations Research is

(A) Independent thinking approach	(B) Group thinking approach
(C) Inter-disciplinary team approach	(D) None of these
- b. The slack variables indicate

(A) Excess resource available	(B) Shortage of resource available
(C) Nil resources	(D) Idle resource
- c. When the elements of net evaluation row of simplex table are equal, the situation is known as

(A) Tie	(B) Degeneracy
(C) Break	(D) Shadow price
- d. Transportation problem is basically a

(A) Maximisation model	(B) Minimisation model
(C) Transshipment problem	(D) Iconic model
- e. The total number of allocation in a basic feasible solution of transportation problem of $m \times n$ size is equal to

(A) $m \times n$,	(B) $(m / n) - 1$
(C) $m + n + 1$	(D) $m + n - 1$
- f. If a two-person zero sum game is converted to a Linear Programming Problem,
 - (A) Number of variables must be two only,
 - (B) There will be no objective function,
 - (C) If row player represents Primal problem, Column player represents Dual problem,
 - (D) Number of constraints are two only.
- g. A competitive situation is known as:

(A) Competition	(B) Marketing
(C) Game	(D) None of these

- h. A customer's behavior of jumping from one queue to another is called
 (A) Balking (B) Jockeying
 (C) Reneging (D) Collusion
- i. A quantitative technique where samples of populations are statistically determined to be used for a number of processes, such as quality control and marketing research is:
 (A) Sampling theory (B) Statistical decision theory
 (C) Linear Programming (D) Simulation
- j. A qualitative forecasting method that obtains forecasts through "group consensus" is known as the
 (A) Delphi approach (B) Mean absolute deviation
 (C) Autoregressive model (D) None of these

PART A

Answer any three questions. Each question carries 16 marks.

- Q.2** a. What is the condition in simplex method that an LPP has no feasible solution? Old hens can be brought for Rs. 2.00 each but young ones cost Rs. 5.00 each. The old hens lay 3 eggs per week and young ones 5 eggs per week, each being worth 30 paise. A hen costs Rs. 1.00 per week to feed. If I have only Rs. 80.00 to spend for hens, how many of each kind should I buy to give a profit of more than Rs. 6.00 per week? Assuming that I cannot house more than 20 hens. Write a mathematical model of the problem. (5)
- b. Write a brief note on application of operations research in marketing. (5)
- c. Use the graphical method to solve the following LPP: (6)
- $$\text{Max } z = x_1 + x_2 / 2$$
- $$\text{subject to } 3x_1 + 2x_2 \leq 12, \quad x_1 + x_2 \geq 8, \quad 5x_1 = 10, \quad -x_1 + x_2 \geq 4,$$
- $$x_1, x_2 \geq 0.$$
- Q.3** a. Find the optimal solution of the LPP:

$$\text{Max } z = 4x_1 + 5x_2$$

$$\text{subject to } 3x_1 + 4x_2 \leq 14, \quad 4x_1 + 2x_2 \leq 8, \quad 2x_1 + x_2 \leq 6,$$

$$x_1, x_2 \geq 0.$$
 Show that the optimality of the solution is not violated if b_1 (RHS of first constraint) varies between 6 and 16. Also find the range of c_2 in order that the optimal solution obtained remains optimal. (12)

b. Consider the following table which presents an optimal solution to some LPP:

		c_j	3	-2	4	0	0	0
C_B	Y_B	X_B	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6
0	Y_4	200	-1/2	2	0	1	-1/2	0
4	Y_3	230	3/2	0	1	0	1/2	0
0	Y_6	420	1	4	0	0	0	1
		$z_j - c_j$	3	2	0	0	2	0

If an additional constraint $3x_1 + 2x_3 \leq 460$ were annexed to the system, would there be any change in the optimal solution? Justify your answer. (4)

Q.4 a. The following table shows all the necessary information on the availability of supply to each warehouse, the requirement of each market and unit transportation cost (in Rs) from each warehouse to each market.

		Market				
		P	Q	R	S	Supply
Warehouse	A	6	3	5	4	22
	B	5	9	2	7	15
	C	5	7	8	6	8
	Demand	7	12	17	9	

The shipping clerk has worked out the following schedule from the experience: 12 units from A to Q, 1 unit from A to R, 8 units from A to S, 15 units from B to R, 7 units from C to P and 1 unit from C to R.

- I. Check and see if the clerk has the optimal schedule.
- II. Find the optimal schedule and minimize total transportation cost.
- III. If the clerk is approached by a carrier route C to Q, who offers to reduce his rate in the hope of getting some business, by how much the rate should be reduced before the clerk will offer him the business. (10)

b. Consider a problem of assigning four tasks. The time (hours) required to complete the task is given below:

		Tasks			
		I	II	III	IV
Clerk	A	4	7	5	6
	B	-	8	7	4
	C	3	-	5	36
	D	6	6	4	2

Clerk B cannot be assigned to task I and clerk C cannot be assigned to task II. Find all the optimum assignment schedule. (6)

Q.5 a. Write the differences between CPM and PERT. (4)

b. Following table gives the list of various activities and their immediate predecessors involved in installation of a CAT scanner in a hospital:

Activity	Predecessor	Expected Duration (days)
A	-	2
B	A	6
C	B	12
D	B	8
E	C	6
F	C	4
G	C	3
H	E, F, G	10
I	H	9
J	D, I	6
K	J	3
L	K	2
M	L	1

- I. Prepare a network diagram for this project.
- II. Find the total time required to install CAT scanner.
- III. Calculate the total float for various non-critical activities. (12)

Q. 6 a. Solve the following game after reducing it to a 2x2 game (7)

		Player B		
		B ₁	B ₂	B ₃
Player A	A ₁	1	7	2
	A ₂	6	2	7
	A ₃	5	1	6

b. A bank has two tellers working on saving accounts. The first teller handles withdrawals only. The second teller handles deposits only. It has been found that the service time distribution for the deposits and withdrawals both are exponential with mean service time 3 minutes per customer. Depositors are found to arrive in a Poission fashion throughout the day with a mean arrival rate 16 per hour. Withdrawals also arrive in a Poission fashion with a mean arrival rate of 14 per hour. What would be the effect on the average waiting time for depositors and withdrawal if each teller could handle both withdrawals and deposits? What would be the effect if this could only be accomplished by increasing service time to 3.5 minutes? (9)

PART B

Answer any two questions. Each question carries 16 marks

- Q.7** a. What are the different functions of management? Briefly explain the roles of managers as per Mintzberg's findings. (8)
b. Draw and explain staff or functional authority organizational structure. (8)
- Q.8** a. Explain the tools for decision making. (8)
b. How do forecasting and decision-tree techniques help in planning and decision making in an organization? (8)
- Q.9** a. What are the different methods for marketing communications? (8)
b. Define leadership and motivation. Explain Herzberg's two-factor model of motivation. (8)