

## AMIETE – ET/CS/IT

Time: 3 Hours

**DECEMBER 2014**

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.

**Q.1 Choose the correct or the best alternative in the following: (2×10)**

a. A BFS in transportation problem has \_\_\_\_\_ cells with positive allocation.

- (A) m (B)  $m \times n$   
(C)  $m + n - 1$  (D)  $m + n$

b. Big-M method is used for

- (A) Transportation (B) Game theory  
(C) Assignment problem (D) LPP

c. CPM is

- (A) Correct project management (B) Critical path method  
(C) Critical project management (D) Correct path method

d. A transportation problem is called balanced if:

- (A)  $\sum_i a_i = \sum_j b_j$  (B)  $\sum_i a_i < \sum_j b_j$   
(C)  $\sum_i a_i > \sum_j b_j$  (D)  $\sum_i a_i \neq \sum_j b_j$

e. Slack variable is added to

- (A) A constraint of  $\leq$  type (B) A constraint of  $\geq$  type  
(C) An equation (D) None of these

f. An assignment problem is said to be balanced if:

- (A) Rows = Columns (B) Rows < Columns  
(C) Rows > Columns (D) None of these

- g. Time series analysis is used in:
- (A) Game Theory (B) Motivation Theory  
(C) Queuing Theory (D) Forecasting
- h. In game theory, the measure of satisfaction that a player gets at the end of each game is called:
- (A) Payment (B) Cost  
(C) Zero-sum (D) Pay-off
- i. Who is known as the “father of modern management theory”?
- (A) Frederick Taylor (B) Henry Fayol  
(C) Douglas McGregor (D) Clayton Alderfer
- j. Maslow’s need hierarchy theory is related to
- (A) Leadership (B) Organization  
(C) Motivation (D) Decision Making

**PART A**

**Answer any THREE Questions. Each question carries 16 marks.**

- Q.2** a. What are the various techniques available for solving OR problems? (4)
- b. Sandow limited has two products, Rose and Lotus. To produce one unit of Rose, 2 units of material X and 4 units of material Y are required and to produce one unit of Lotus 3 units of X and 2 units of material Y are required. At least 16 units of each material must be used in order to meet the committed sales of the two products. Cost per unit of material X and material Y are Rs. 2.50 and Rs. 0.25 respectively. Formulate the problem as LPP and solve it graphically to minimize the total cost. (12)
- Q.3** a. Write the dual of the following LPP: (4)
- Minimum  $z = 4x_1 + 6x_2 + 18x_3$   
 Subject to:  $x_1 + 3x_2 \geq 3$   
 $x_2 + 2x_3 \geq 5$  and  $x_j \geq 0, j = 1, 2, 3$
- b. Solve the following LPP: (12)
- Minimize  $z = 8x_1 - 2x_2$   
 Subject to:  $-4x_1 + 2x_2 \leq 1$   
 $5x_1 - 4x_2 \leq 3$   
 $x_1, x_2 \geq 0$

- Q.4** a. Build the mathematical model for the following transportation problem, where the objective is to minimize the costs involved in transporting goods from factory to warehouses. (4)

	W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	supply
F <sub>1</sub>	1	2	4	4	6
F <sub>2</sub>	4	3	2	0	8
F <sub>3</sub>	0	2	2	1	10
	4	5	8	6	

- b. Five lathers are to be allotted to five operators (one for each). The following table gives weekly output figures (in pieces): (12)

		Weekly		Output		
		L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub>	L <sub>4</sub>	L <sub>5</sub>
	P	20	22	27	32	36
Operators	Q	19	23	29	34	40
	R	23	28	35	39	34
	S	21	24	31	37	42
	T	24	28	31	36	41

Profit per piece is Rs. 25. Find the maximum profit per week.

- Q.5** a. Distinguish between total float and free float. (6)
- b. A project consists of eight activities with the following time estimates: (10)

Activity	Immediate Predecessor	Time (days)		
		Optimistic	Most Likely	Pessimistic
A	---	1	1	7
B	---	1	4	7
C	---	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

- (i) Draw a PERT network with the above information.
- (ii) Determine the critical path
- (iii) Find Earliest Start, Earliest Finish, Latest Start, Latest Finish times for each activity
- (iv) Also find Total Float

- Q.6** a. Define saddle point in a two-player zero-sum game. Find out the saddle point for the given pay-off matrix: (4)

$$A = \begin{bmatrix} 3 & 4 & 1 & -2 \\ 2 & 5 & 2 & 4 \\ -5 & 2 & 1 & 0 \end{bmatrix}$$

- b. Arrivals at a telephone booth are considered to be following Poisson distribution with an average time of 10 minutes between one arrival and the next. Length of a phone call is assumed to be distributed exponentially with mean 3 minutes. Find: (12)
- What is the probability that a person arriving at the booth will have to wait?
  - What is the average length of the queue that is formed time to time?
  - The telephone department will install a second booth when convinced that an arrival would expect waiting for at least 3 minutes for phone. By how much should the flow of arrivals increase in order to justify a second booth?

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**PART B**

Answer any **TWO** questions. Each question carries 16 marks.

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- Q.7** a. Justify 'Management is an art or science'. (8)
- b. Define the principles of management given by Henry Fayol. (8)
- Q.8** a. Define the various steps involved in the process of decision making. (8)
- b. Differentiate between qualitative methods and quantitative methods of forecasting. (8)
- Q.9** Write short notes on any **TWO** of the following: (8×2)
- Leadership styles
  - Market segmentation
  - Types of Communication