

## AMIETE – ET/CS/IT (New Scheme)

Time: 3 Hours

June 2018

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. Operations research approach is
 

(A) Multi-disciplinary	(B) Scientific
(C) Intuitive	(D) All of these
- b. Decision variables are
 

(A) Uncontrollable	(B) Controllable
(C) Parameters	(D) None of these
- c. A feasible solution to the linear programming problem should
 

(A) Satisfy the problem constraints	(B) Optimize the objective function
(C) Satisfy the problem constraints and non-negativity restrictions	(D) Satisfy the non-negativity restrictions.
- d. The solution to a transportation problem with  $m$ -rows (suppliers) and  $n$ -column (destinations) is feasible if number of positive allocations are
 

(A) $m + n$	(B) $m \times n$
(C) $m + n - 1$	(D) $m + n + 1$
- e. If there are  $n$  workers and  $n$  jobs, there would be
 

(A) $n!$ solutions	(B) $(n - 1)!$ solutions
(C) $(n!)^n$ solutions	(D) $n$ solutions
- f. Network models have advantage in terms of project
 

(A) Planning	(B) Scheduling
(C) Controlling	(D) All of these
- g. What happens when maximin and minimax values of the game are same?
 

(A) No solution exists	(B) Solution is mixed
(C) Saddle point exists	(D) None of these

- h. Which of the following is not a key operating characteristic for a queuing system?
- (A) Utilization factor  
 (B) Percent idle time  
 (C) Average time spent for waiting in system and queue  
 (D) None of these
- i. Managerial Control includes:
- (A) Financial Control (B) Budgetary Control  
 (C) Production Control (D) All of these
- j. Strategy formulation is part of:
- (A) Planning (B) Organizing  
 (C) Directing (D) Control

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**PART- A (Operations Research)**

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

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- Q.2** a. A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes namely suitings, shirtings and woolen yielding the profit of Rs. 2, Rs.4 and Rs. 3 per meter respectively. One meter suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing, 1 meter of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minute in packing, while 1 meter woolen requires 3 minutes in each department. In a week, total run time of each department is 60, 40 and 80 hours of weaving, processing and packing departments respectively. Formulate the linear programming problem to find the product mix to maximize the profit. (8)
- b. Solve graphically the following L.P.P: (8)
- Maximize  $Z = 2x_1 + 3x_2$
- Subject to  $x_1 + x_2 \leq 30, x_2 \geq 3, 0 \leq x_2 \leq 12,$
- $x_1 - x_2 \geq 0, 0 \leq x_1 \leq 20.$
- Q.3** a. Solve the following L.P.P: (10)
- Maximize  $Z = 2x_1 + x_2 + 105x_3$
- Subject to  $-6x_1 + x_2 + 14x_3 \leq 7,$
- $-12x_1 + x_2 + 32x_3 \leq 10,$
- $-x_1 - x_2 + 3x_3 \leq 0,$
- $x_1, x_2, x_3 \geq 0.$

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b. Write Dual of the following LP Problem: (6)

$$\text{Maximize } Z = 3x_1 + x_2 + 3x_3 - x_4$$

$$\text{Subject to } 2x_1 - x_2 + 3x_3 + x_4 = 1$$

$$x_1 + x_2 - x_3 + x_4 = 3$$

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

**Q.4** a. Determine the optimal solution to the following transportation problem (8)

	A	B	C	$a_i$
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
$b_j$	4	2	2	

b. Write a note on PERT and CPM techniques. Also write basic steps in PERT and CPM techniques. (8)

**Q.5** a. A project has the following characteristics

Activity	Most optimistic time (a)	Most pessimistic time (b)	Most likely time (m)
(1-2)	1	5	1.5
(2-3)	1	3	2
(2-4)	1	5	3
(3-5)	3	5	4
(4-5)	2	4	3
(4-6)	3	7	5
(5-7)	4	6	5
(6-7)	6	8	7
(7-8)	2	6	4
(7-9)	5	8	6
(8-10)	1	3	2
(9-10)	3	7	5

Construct a PERT network. Find critical path and variance for each event. Find the project duration at 95% probability. (8)

b. Discuss the characteristic of the Game theory. (8)

**Q.6** a. Solve the two-person, zero-sum game whose pay off matrix is

		Players B		
		I	II	III
Players A	I	-3	-2	-3
	II	2	0	2
	III	5	-2	-4

Find the optimal strategy, if any. (8)

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- b. Babies are born in a sparsely populated state at the rate of one birth every 12 minutes. The time between births follows an exponential distribution. Find the following:
- (i) The average number of births per year
  - (ii) The probability that no births will occur in any one day.
  - (iii) The probability of issuing 50 birth certificates in 3 hours given that 40 certificates were issued during the first 2-hours of the 3-hour period. (8)

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**PART- B (Engineering anagement)****Answer any TWO Questions. Each Question carries 16 marks.**

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- Q.7** a. Briefly describe the features of management\* (8)
- b. Briefly describe the elements and tools of scientific management\* (8)
- Q.8** a. Describe the Legal forms of organization in details. (8)
- b. Briefly describe the technological forecasting. (8)
- Q.9** a. Briefly describe the nature of Motivation. (8)
- b. Discuss the importance of control. (8)