ROLL NO. _____

# Code: AE62/AC62/AT62
# Subject: OPERATIONS RESEARCH & ENGG. MANAGEMENT

## AMIETE – ET/CS/IT (Current Scheme)

**Time: 3 Hours** **December - 2017** **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 feasible solution to a $m \times n$ transportation problem is said to be basic feasible solution if the total number of allocation is exactly equal to
**(A)** $m+n$ **(B)** $m+n-1$
**(C)** $m+n+1$ **(D)** $m-n$

b. A customer's behavior of jumping from one queue to another is called
**(A)** Balking **(B)** Reneging
**(C)** Jockeying **(D)** Collusion

c. The objective of network analysis is to
**(A)** Minimize total project duration
**(B)** Maximize total project cost
**(C)** Maximize production delays and conflicts
**(D)** All of these

d. If $t_p$, $t_o$are pessimistic and optimistic time of an activity respectively, then the variance of an activity is calculated as
**(A)** $\left(\frac{t_p+t_o}{4}\right)^2$ **(B)** $\left(\frac{t_p+t_o}{6}\right)^2$
**(C)** $\left(\frac{t_p-t_o}{4}\right)^2$ **(D)** $\left(\frac{t_p-t_o}{6}\right)^2$

e. In game theory, a saddle point exists when
**(A)** Maximin value = Maximax value
**(B)** Minimax value = Minimum value
**(C)** Minimax value = Maximin value
**(D)** None of these

f. For a maximization LPP model, the simplex method is terminated when all values
**(A)** $c_j - z_j \le 0$ **(B)** $c_j - z_j \ge 0$
**(C)** $c_j - z_j + 0$ **(D)** $z_j \le 0$

g. Surplus variable is added to
**(A)** A constraint of $\leq$ type **(B)** A constraint of $\geq$ type
**(C)** An equation **(D)** None of these

h. The method used for solving an Assignment problem is called
**(A)** Reduced matrix method **(B)** MODI method
**(C)** Hungarian method **(D)** None of these.

i. The prime element of a strategic plan is
**(A)** Business process **(B)** Product marketing
**(C)** Product manufacture **(D)** Technology development

j. The number of classification of consumer goods on the basis of buying habits of users is
**(A)** 1 **(B)** 2
**(C)** 3 **(D)**4

## PART A

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

**Q.2** a. Define Operations research and explain its scope. **(8)**

b. A home resourceful decorator manufactures two types of lamps say A and B. Both lamps go through two technicians, first a cutter and second a finisher. Lamp A requires 2 hours of the cutter's time and 1 hour of finisher's time; Lamp B requires 1 hour of cutter's time and 2 hours of finisher's time. The cutter has 104 hours and finisher has 76 hours of available time each month. Profit on Lamp A is Rs. 6 and lamp B is Rs. 11. Formulate a linear programming model to maximize the profit. **(8)**

**Q.3** a. Express the following LPP in standard form: **(4)**

$$Max\, Z = 3x_1 + 4x_2 + 7x_3$$
$$Subject\ to: 6x_1 - 4x_2 \leq 5$$
$$4x_1 + 2x_2 + 3x_3 \geq 11$$
$$5x_1 + 3x_3 \leq 2;\ x_1, x_2 \geq 0, x_3\ unrestricted$$

b. Using duality, solve: **(12)**

$$Min\, Z = 0.7x_1 + 0.5x_2$$
$$Subject\ to: x_1 \geq 4, x_2 \geq 6, x_1 + 2x_2 \geq 20$$
$$2x_1 + x_2 \geq 18;\ x_1, x_2 \geq 0$$

**Q.4** Find the initial basic feasible solution for the following transportation problem using Vogel's approximation method. Also find the optimal solution using MODI's method to minimize the transportation cost: **(6+10)**

| Source/ Destination | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Capacity |
|---|---|---|---|---|---|
| $S_1$ | 19 | 30 | 50 | 10 | 7 |
| $S_2$ | 70 | 30 | 40 | 60 | 9 |
| $S_3$ | 40 | 8 | 70 | 20 | 18 |
| Demand | 5 | 8 | 7 | 14 | |

**Q.5** a. Define the following terms related to network analysis: **(4)**
(i) Node (ii) Flow (iii) Path (iv) tree

b. Tasks A, B, C,…, H, I constitute a project. The precedence relationships are A < D; A< E; B< F; D < F; C<G; C < H; F < I; G< I. Draw a network to represent the project and find the minimum time of completion of the project when, time in days of each task is as follows:

| Task : | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| Time (days): | 8 | 10 | 8 | 10 | 16 | 17 | 18 | 14 | 9 |

Also find the critical path. **(12)**

**Q.6** a. Define Two-persons zero sum game. Solve the game whose payoff matrix is given below: **(6)**

Player B

| Player A | | | | |
|---|---|---|---|---|
| | 3 | 2 | 4 | 0 |
| | 3 | 4 | 2 | 4 |
| | 4 | 2 | 4 | 0 |
| | 0 | 4 | 0 | 8 |

b. The rate of arrival of customers at a public telephone booth follows Poisson distribution with an average time of 9 minutes between one customer and the next. The duration of a phone call is assumed to follow exponential distribution with mean time of 3 minutes.
(i) Determine the probability that a person arriving at the booth will have to wait
(ii) What is the average length of the non-empty queue that form from time to time?
(iii) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for the phone. Find the increase in flow rate of arrivals which will justify a second booth
(iv) What is the probability that an arrival will have to wait for more than 10 minutes before the phone is free?
(v) Estimate the fraction of the day that the telephone will be in use. **(2x5)**

## PART B
**Answer any TWO Questions. Each question carries 16 marks.**

**Q.7** a. What are the processes involved in strategy formulation? Explain it. **(8)**

b. Explain the different management styles **(8)**

**Q.8** a. Explain the qualitative techniques for forecasting **(8)**

b. With the help of a case study, explain the need of marketing information. **(8)**

**Q.9** a. Discuss in detail the organization structure. **(8)**

b. What are the different methods for marketing communications? **(8)**