ROLL NO. _____

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

AMIETE – ET/CS/IT

Time: 3 Hours **DECEMBER 2012** **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. The scientific method in OR study generally involves:

(A) Judgement Phase **(B)** Research Phase
(C) Action Phase **(D)** All of these

b. Which of the following is not a major requirement of a Linear Programming Problem?

(A) There must be alternative course of action among which to decide
(B) An objective for the firm must exist
(C) The problem must be of maximization type
(D) Resources must be limited

c. Which of the following assertations is true of an optimal solution to Linear Programming Problem?

(A) Every LP has an optimal solution
(B) The optimal solution always occur at extreme points
(C) If an optimal solution exists, there will always be atleast one at a corner
(D) All of these

d. According to expectancy theory, the intensity of motivation functions is

(A) very difficult to determine
(B) indirectly proportional to perceived rewards
(C) directly proportional to perceived or expected rewards
(D) indirectly proportional to expected rewards

e. The North West Corner rule:

(A) Is used to find an initial feasible solution
(B) Is used to find an optimal solution
(C) Is based on the concept of minimizing opportunity cost
(D) None of these

f. In a departmental store customers arrive at a rate of 20 customers per hour. The average number of customers that can be handled by cashier is 24 per hour. What is arrival rate in this problem?

(A) 20 **(B)** 3
(C) 24 **(D)** 10

g. What is meant by 'Payoffs' in Game Theory?

(A) outcome of a game when different alternatives are adopted by players
(B) number of players involved in a game
(C) value of a game
(D) strategies used by players

h. A quantitative technique for decision making that shows a complete picture of potential alternative decision paths is called _____.

(A) the Delphi technique **(B)** a decision tree
(C) brainstorming **(D)** payback analysis

i. The skills that all managers need are _____.

(A) planning, organizing and controlling
(B) conceptual, technical and human
(C) effectiveness, efficiency and planning
(D) interpersonal, decisional and informational

j. Line Organisation is the one in which

(A) Simplest, most direct type, observes hierarchy
(B) Purely advisory (generalist/specialist) to the line structure, with no authority to place recommendations into action
(C) Permits specialist in a given area to enforce directives within a limited and clearly defined scope of authority.
(D) None of these

PART A

Answer any THREE Questions. Each question carries 16 marks.

Q.2 a. Explain the scope of Operation Research in various fields of Engineering and Non-Engineering applications. **(4)**

b. Solve the following LPP by graphical method

Minimize Z = $20x_1 + 40x_2$

Subject to constraints

$36x_1 + 6x_2 \geq 108$

$3x_1 + 12x_2 \geq 36$

$20x_1 + 10x_2 \geq 100$

$x_1, x_2 \geq 0$ **(12)**

Q.3 a. Solve the following LPP by Simplex method **(6)**

Maximize Z = $80x_1 + 55x_2$

Subject to

$4x_1 + 2x_2 \leq 40$

$2x_1 + 4x_2 \leq 32$

and $x_1, x_2 \geq 0$

b. Write the Dual of the following LPP **(10)**

Min Z = $4x_1 + 5x_2 - 3x_3$

Subject to constraints,

$x_1 + x_2 + x_3 = 22$

$3x_1 + 5x_2 - 2x_3 \leq 65$

$x_1 + 7x_2 + 4x_3 \geq 120$

$x_1, x_2 \geq 0$ and x_3 is unrestricted

Q.4 a. Explain the Hungarian Method used for solving assignment problem. **(6)**

b. Certain equipment needs 5 repair jobs which have to be assigned to 5 machines. The estimated time (in hours) that a mechanic requires to complete the repair job is given in the table. Assuming that each mechanic can be assigned only one job, determine the minimum time assignment. **(10)**

	J_1	J_2	J_3	J_4	J_5
M_1	7	5	9	8	11
M_2	9	12	7	11	10
M_3	8	5	4	6	9
M_4	7	3	6	9	5
M_5	4	6	7	5	11

Q.5 a. Construct an arrow diagram for the following project **(6)**

Activities	**Relationship**
A	Precedes B, C
B	Precedes D, E
C	Precedes D
D	Precedes F
E	Precedes G
F	Precedes G

b. Construct the Network for the following Project and determine the following:
(i) Critical Path
(ii) ES, EF, LS, LF
(iii) TF, FF **(10)**

Activity	Duration
1-2	14
1-4	3
2-3	7
2-4	0
3-5	4
4-5	3
5-6	10

Q.6 a. What is the procedure to determine Saddle point. **(4)**

b. Customers arrive at the first class ticket counter of a theatre at a rate of 12 per hours. There is one clerk serving the customers at a rate of 30 per hour. Assuming the conditions for use of the single channel queuing model, evaluate:
(i) The probability that there is no customer at the counter (i.e. that the system is idle)
(ii) The probability that there are more than 20 customers at the counter
(iii) The probability that there is no customer waiting to be served
(iv) The probability that a customer is being served and nobody is waiting. **(12)**

PART B
Answer any TWO questions. Each question carries 16 marks.

Q.7 a. Differentiate between traditional management versus modern management. **(6)**

b. List the essential qualities and activities of an Engineering Manager. **(10)**

Q.8 a. Explain Steps, Methods and Selection Factors used in Forecasting. **(8)**

b. How SWOT analysis helps into strategy formulation? **(8)**

Q.9 a. Explain the Hertzberg's Theory of Motivation. **(8)**

b. Explain different types of market segmentation. List the requirements for effective market segmentation. **(8)**