ROLL NO. ___________________

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

AMIETE – ET/CS/IT (NEW SCHEME)

Time: 3 Hours **JUNE 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. Which of the following statements are true?

(A) Every LPP admits an optimal solution
(B) Every LPP admits unique optimal solution
(C) If an LPP admits two optimal solutions it has an infinite number of optimal solutions
(D) The set of all feasible solutions to an LPP is not a convex set

b. Phase I of simplex method_________

(A) optimizes the objective function of the given problem
(B) gives a starting Basic feasible solution
(C) is required if a variable is unrestricted in sign
(D) None of these

c. let f(x) denote the objective function of an LPP, then

(A) max f(x)= –min[–f(x)] **(B)** max f(x)= – min[f(–x)]
(C) max f(x)= – min[f(x)] **(D)** max f(x)= min[–f(–x)]

d. If in the primal the number of constraints are m and in dual the number of variables are n. Then

(A) $m \geq n$ **(B)** $m \leq n$
(C) $m = n$ **(D)** None of these

e. The average no. of customers in the queue for the queuing model $M|M|1:(\infty/FCFO)$ system is $\left(\text{where } \rho = \dfrac{\text{mean arrival rate}}{\text{mean service rate}}\right)$

(A) $\dfrac{\rho^2}{1-\rho}$ **(B)** $\dfrac{\rho}{1-\rho}$

(C) $1-\rho$ **(D** $\dfrac{1}{(1-\rho)^2}$

f. In the context of game theory, the minimax value $\bar{v}$ maximin value $\underline{v}$ and value of game v, are related as

(A) $\underline{v} \le v \le \bar{v}$ **(B)** $\bar{v} \le v \le \underline{v}$
(C) $\underline{v} < v < \bar{v}$ **(D)** $\underline{v} > v > \bar{v}$

g. Which of the following is not a function of management?

(A) Planning **(B)** Coordination
(C) Organizing **(D)** Directing

h. Managers at the top level spend more time in__________

(A) Planning **(B)** Organising
(C) Staffing **(D)** Directing

i. Through ____________management helps individuals to develop team spirit, cooperation and commitments to group success.

(A) Coordination **(B)** Supervision
(C) Controlling **(D)** Motivation and leadership

j. Which of the following is not an element of delegation?

(A) Accountability **(B)** Authority
(C) Responsibility **(D)** Informal organisation

PART A

Answer any THREE Questions. Each question carries 16 marks.

Q.2 a. What is Operations Research? Give role of Operations Research in Engineering. **(6)**

b. John must work at least 20 hours a week to supplement his income while attending school. He has the opportunity to work in two retail stores: in store-1, John can work between 5 and 12 hours a week, and in store-2 he is allowed to work between 6 and 10 hours. Both stores pay the same hourly wage. John thus wants to base his decision about how many hours to work in each store on a different criterion: work stress factors. Based on interviews with present employees, John estimates that, on a scale of 1 to 10, the stress factors are 8 and 6 at store 1 and 2 respectively. Because stress mounts by the hour, he presumes that the total stress at the end of the week is proportional to the number of hours he works in the store. How many hours should John work in each store? Find the solution by graphical method. **(10)**

Q.3 a. Prove that dual of the dual is the primal. **(3)**

b. Obtain the dual of the following LPP maximize $z=3x_1+5x_2+7x_3$ **(3)**
Subject to

$$x_1 + x_2 + 3x_3 \le 10$$
$$4x_1 - x_2 + 2x_3 \ge 15$$
$$x_1, x_2 \ge 0, x_3 \text{ unrestricted in sign}$$

c. From the following initial simplex tableau:

Basis	C_j	x_1 15	x_2 25	S_1 0	S_2 0	A_1 –M	A_2 –M	Solution
A_1	–M	7	6	–1	0	1	0	20
S_2	0	8	5	0	1	0	0	30
A_2	–M	3	–2	0	0	0	1	18
	Z_j	–10M	–4M	M	0	–M	–M	–38M
	$C_j – Z_j$	15+10M	25+4M	–M	0	0	0	

Write down the original problem represented by the above tableau. Find out the optimal solution of this problem. Is it a unique solution? Why? **(10)**

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

		Market I	Market II	Market III	Market IV	Supply
Warehouse	A	5	2	4	3	22
	B	4	8	1	6	15
	C	4	6	7	5	8
Requirement		7	12	17	9	

The shipping clerk has worked-out the following schedule from experience: 12 units from A to II, 1 unit from A to III, 9 units from A to IV, 15 units from B to III, 7 units from C to I, 1 unit from C to III. (i) Check and see if the clerk has the optimal schedule. (ii) Find the optimal schedule and minimum total shipping cost. (iii) If the clerk is approached by a carrier of route C to II who offers to reduce his rate in the hope of getting some business, by how much must the rate be reduced before the clerk should consider giving him an order. **(6)**

b. A company has four territories open and four salesmen available for the assignment. The territories are not equally rich in their sales potential; it is estimated that a typical salesman operating in each territory would bring in the following annual sales.

Territory	I	II	III	IV
Annual sales (Rs)	60,000	50,000	40,000	30,000

Four salesmen are considered to differ in their ability. It is estimated that working under the same conditions their yearly sales would be proportional as follows:

Salesman	A	B	C	D
Proportion	7	5	5	4

If the criterion is to maximize expected total sales, then the intuitive answer is to assign the best salesman to the richest territory, the next best salesman to the second richest and so on. Verify this answer by the assignment technique. **(10)**

Q.5 a. Give the difference between PERT and CPM. **(4)**

b. A project consists of a series of tasks labelled A,B,…..,H,I with the following relationships (W<X,Y means X and Y cannot start until W is completed; X,Y<W means W cannot start until both X and Yare completed) with this notation construct network diagram having the following constraints:
(i) A<D,E (ii) B,D<F (iii) C<G (iv) B, G<H (v) F,G<I
Also find the optimum time of completion of the project and earliest start, earliest finish, latest start, latest finish time, when the time (in days) of completion of each task is as follows:

Task	A	B	C	D	E	F	G	H	I
Time	23	8	20	16	24	18	19	4	10

(12)

Q.6 a. On an average 96 patients per 24-hours per day require the service of an emergency clinic. Also on average a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs 100/- per patient treated to obtain an average servicing time of 10 minutes and that each minute of decrease in this average time could cost Rs 10/- per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from 1⅓ patients to ½ patient. **(8)**

b. There is a famous Italian game called "Two finger Morra". This is played by two people each of whom shows one or two fingers and simultaneously guesses the number of fingers his opponent will show. If just one player guesses correctly, he wins an amount equal to the sum of fingers shown by himself and by his opponent, otherwise the game is considered a draw. Obtain the pay-off matrix corresponding to it. **(4)**

c. Write a short note on game theory. **(4)**

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

Q.7 a. Discuss various schools of management thought prevalent from time to time. **(8)**

b. Explain the concept of matrix organisation structure. **(8)**

Q.8 a. What is decision making? Explain decision making process. **(8)**

b. What do you understand by strategic planning? Why is it important to the modern organisation? **(8)**

Q.9 a. Explain the process of communication. **(8)**

b. Answer the following:
(i) What is meant by leadership?
(ii) What do you understand by the term pricing? **(8)**