Subject: OPERATIONS RESEARCH & ENGINEERING MANAGEMENT

Time: 3 Hours **Max. Marks: 100**

JUNE 2011

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 constraint in an LPP restricts

(A) value of objective function **(B)** value of decision variables
(C) use of available resources **(D)** uncertainty of optimum value

b. The role of artificial variables in simplex method is

(A) To aid in finding initial basic feasible solution
(B) To start phases of simplex method
(C) To find shadow prices from the final simplex table
(D) None of the above

c. When there are more than one server, customer behaviour in which he moves from one queue to another is known as

(A) balking **(B)** jockeying
(C) reneging **(D)** alternating

d. The slack for an activity in network, is equal to

(A) LS-ES **(B)** LF-LS
(C) EF-ES **(D)** EF-LS

e. In deterministic queuing model

(A) Arrival rate is known and the service time is also certain
(B) Arrival rate must not exceed the service rate.
(C) The service rate and service time are reciprocals of each other.
(D) If the arrivals occur according to a poisson distribution, the inter-arrival times would be exponentially distributed.

f. For a two person zero sum game, the value of game can be

(A) determined only if the pay off matrix has a saddle point
(B) positive, negative or zero
(C) determined only if the game is fair
(D) None of above

g. The managers who are driven by extreme personal ambition and will sac everything including self and family to get at the top of the corporate ladder

(A) Administrators **(B)** Time servers
(C) Climbers **(D)** Generals

h. _____ can be very powerful and beneficial if they are made to work in the interest of the whole organization.

(A) Line organizations **(B)** Staff organizations
(C) Matrix organizations **(D)** Informal organization

i. _____ method of forecasting uses the judgment of a panel of experts to arrive at a converged result on the forecast value.

(A) Scenario building **(B)** Delphi
(C) Normative relevance **(D)** Time series

j. In _____ pattern, the team members communicate through one member, who is its leader

(A) Mesh **(B)** Linear
(C) Star **(D)** Tree

PART A

Answer any THREE Questions. Each question carries 16 marks.

Q.2 a. Briefly explain the Phases of Operation Research Study. **(6)**

b. A firm uses lathe, milling machine and grinder to make two machine parts. The table below represents the machining time required for each part, the machining time available on different machines and the profit on each machine part. Find the number of part I and part II to be manufactured per week in order to maximize the profit. Solve LPP by Graphical method. **(10)**

Type of machine	Machining time required for the machined parts (minutes)		Machining time required per week (minutes)
	I	II	
Lathe	12	6	3000
Milling Machine	4	10	2000
Grinding machine	2	3	900
Profit per unit	Rs.40	Rs.100	

Q.3 a. Use Big-M method to maximize $z = 6x_1+4x_2$ **(12)**
Subject to the constraints
$2x_1+3x_2 \leq 30$
$3x_1+2x_2 \leq 24$
$x_1+x_2 \geq 3$
$x_1 \geq 0$ and $x_2 \geq 0$

b. Obtain dual of the following L.P.P **(4)**
maximize $z = 2x_1+x_2$

Subject to constraints:

$x_1+2x_2 \leq 10$

$x_1+x_2 \leq 6$

$x_1-x_2 \leq 2$

$x_1-2x_2 \leq 1$

$x_1 , x_2 \geq 0$

Q.4 a. Use Vogel's Approximation method to solve the following Transportation Cost (T.C) problem [Note: O = ORIGIN, D = DESTINATION] **(8)**

	D1	D2	D3	D4	Availability
O1	21	16	25	13	11
O2	17	18	14	23	13
O3	32	27	18	41	19
Requirement	6	10	12	15	

b. A pharmaceutical company is producing a single product and selling it through five agencies located in different cities. All of a sudden, there is a demand for the product in another five cities not having any agency of the company. The company is faced with the problem of deciding on how to assign the existing agencies to dispatch the product to needy cities in such a way that the travelling distance is minimized. The distance between the surplus and deficit cities (in km) is given in the following table. **(8)**

Deficit cities

Surplus cities	P	Q	R	S	T
A	85	75	65	125	75
B	90	78	66	132	78
C	75	66	57	114	69
D	80	72	60	120	72
E	76	64	56	112	68

Determine the optimum assignment schedule.

Q.5 a. Distinguish between PERT and CPM. Define critical path? **(4)**

b. A project with the following six activities is listed with the normal time period for completion of each activity. Draw the network diagram and find out the time for completion of the project. Also calculate total slack for each activity. **(12)**

Activity	Time Duration	Immediate Predecessor
A	4	-
B	8	A
C	8	A
D	5	B
E	7	C
F	5	D,E

Q.6 a. Solve the following game by linear programming technique- **(10)**

Player B

Player A $\begin{pmatrix} 1 & -1 & 3 \\ 3 & 5 & -3 \\ 6 & 2 & -2 \end{pmatrix}$

b. A bank has only one typist. Since the typing work varies in length (number of pages to be typed) the typing rate is randomly distributed approximating a Possion distribution with mean service rate of 8 letters per hour. The letters arrive at a rate of 5 per hour during the entire 8 hour work duty. If the typewriter is valued at Rs. 1.50 per hour. Determine **(6)**

(i) Equipment utilization
(ii) The percentage time that an arriving letter has to wait.
(iii) Average system time
(iv) Average cost due to waiting on the part of the typewriter.

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

Q.7 a. Explain the key responsibilities of a manager. **(8)**

b. What are the barriers to change in an organization and how the change management is implemented? **(8)**

Q.8 a. Write a note on Alliances and Acquisition. **(8)**

b. What is forecasting? Explain the Time Series technique for forecasting. **(8)**

Q.9 a. Explain the different leadership theories. **(8)**

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