C.U.SHAH UNIVERSITY
Summer Examination-2017

Subject Name: Operation Research

Subject Code: 4TE07ORE1   **Branch: B.Tech (Mechanical)**

Semester: 7   **Date: 03/04/2017**   **Time : 02:30 To 05:30**   **Marks : 70**

Instructions:
  (1) Use of Programmable calculator & any other electronic instrument is prohibited.
  (2) Instructions written on main answer book are strictly to be obeyed.
  (3) Draw neat diagrams and figures (if necessary) at right places.
  (4) Assume suitable data if needed.

Q-1   **Attempt the following questions:**   **(14)**

a) The variables assigned the value zero are called _____
   (a) Non-basic variables   (b) Basic variables
   (c) Surplus variables   (d) Slack variables

b) PERT is basically_____method
   (a) Size-oriented   (b) Scale-oriented
   (c) Time-oriented   (d) Time and size oriented

c) Which of the following is not associated with any LPP_____
   (a) feasible solution   (b) optimum solution
   (c) Basic solution   (d) Quadratic equation

d) In Transportation problem, optimal solution can be verified by using
   (a) north west corner rule   (b) least cost method
   (c) MODI method   (d) matrix method

e) _____ refers to the number of customers in the waiting line
   (a) service order   (b) queue length
   (c) waiting time in queue   (d) none of the above

f) This innovative science of Operations Research was discovered during_____
   (a) Civil War   (b) World War I
   (c) World War II   (d) Industrial Revolution

g) Operations Research study generally involves how many phases?
   (a) Three   (b) Four
   (c) Five   (d) Two

h) If the injured goes to doctor for treatment then in queuing system the doctor and injured are respectively_____
   (a) Customer and server   (b) Server and customer
   (c) Both server   (d) none of the above

i) If the total supply is less than the total demand, a dummy source (row) is included in the cost matrix with_____
   (a) Dummy Demand   (b) Dummy Supply
   (c) Zero Cost   (d) Both A and B

j) In assignment problem if number of rows is greater than column then
   (a) dummy column is added   (b) dummy row added
   (c) row with cost 1 is added   (d) column with cost 1 is added

k) A critical activity has
   (a) maximum slack   (b) minimum slack
   (c) zero slack   (d) average slack

l) For solving an assignment problem, which method is used?
   (a) Hungarian   (b) American
   (c) German   (d) Both are incorrect

m) A-B-C analysis is used in
   (a) CPM   (b) PERT
   (c) Inventory control   (d) All of these

n) Actual performance of a task is called
   (a) an event   (b) an activity
   (c) a duration   (d) none of these

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**

(a) What do you mean by duality? What are the rules to form a dual problem from the primal problem? **(07)**

(b) Use graphical method to solve the following L.P.P. **(07)**
Minimize, $Z = 10x_1 + 5x_2$
Subject to, $0.5x_1 + x_2 \leq 20$; $1.5x_1 + 0.5x_2 \geq 15$; $2x_1 + 1.5x_2 \geq 30$
      $x_1, x_2 \geq 0$.

Q-3   **Attempt all questions**

(a) Define the following terms: **(04)**
1. Slack variable 2. Surplus variable 3. Artificial variable 4. Basic feasible solution

(b) Solve the following LPP by Big-M method. **(10)**
Maximize $Z = 2x_1 + 4x_2 - 3x_3$
Subject to, $x_1 + x_2 + x_3 \geq 8$
      $x_1 - x_2 \geq 1$
      $3x_1 + 4x_2 + x_3 \leq 40$
      $x_1, x_2, x_3 \geq 0$.

Q-4   **Attempt all questions**

(a) Discuss the Various phases in solving an Operation Research model. **(07)**

(b) A Machine is producing either product A or B. It can produce product A by using 2 units of chemicals and 1 unit of a compound and can produce B by using 1 unit of chemical and 2 units of compound. Only 800 units of chemical and 100 units of compound are available. The profits available per unit of A and B are Rs. 30 and Rs. 20 respectively. Find the optimum allocation of units between A and B to maximize the total profit. Give a mathematical formulation to the LP Problem. **(07)**

Q-5   **Attempt all questions**

(a) Define the following Terms with respect to CPM: **(04)**
1. EST 2. EFT 3. LST 4. LFT

(b) What do you mean by AOA diagram and AON diagram with reference to **(04)**

project?

(c) Draw the network diagram. Also find out critical path for given activities and find out total float. **(06)**

Activity	Duration	Activity	Duration
1-2	6	3-5	8
1-3	9	2-6	12
2-4	3	4-6	7
3-4	4	5-6	1

Q-6   Attempt all questions

(a) Explain the various elements of queuing system. **(07)**

(b) Self-help canteen employs one cashier at its counter, 8 customers arrive every 10 minutes on an average. The cashier can serve at the rate of one customer per minute. Assume Poisson's distribution for arrival and exponential distribution for service patterns. Determine: **(07)**
   i.   Average number of customers in the system
   ii.   Average queue length
   iii.   Average time a customer spends in the system

Q-7   Attempt all questions

(a) What is degeneracy in transportation problems? Explain how to resolve degeneracy in a transportation problem. **(07)**

(b) Find the initial basic feasible solution of the following transportation problem by Vogel's Approximation Method. **(07)**

Warehouses

		W1	W2	W3	W4	Capacity
	F1	19	30	50	10	7
Factory	F2	70	30	40	60	9
	F3	40	8	70	20	18
Requirement		5	8	7	14	

Q-8   Attempt all questions

(a) Write a short note on: ABC analysis. **(07)**

(b) The following mortality rates have been observed for certain type of light bulbs: **(07)**

End of week	1	2	3	4	5
Percentage failing	10	20	50	70	100

There are 1000 bulbs in use and it costs Rs. 10 to replace an individual bulb which has burnt out. If all the bulbs are replaced simultaneously, it would cost Rs. 5 per bulb. It is proposed to replace all the bulbs at fixed intervals whether they have fixed or not and to continue replacing fused bulbs as and when they fail. At what intervals should all the bulbs be replaced so that the proposal is economical?