TME-601 1042

Even Semester Examination 2018-19

B. TECH. (Mechanical Engineering) (SEMESTER-VI)

OPERATION RESEARCH

Time: 03:00 Hours **Max Marks :100**

Note : **All** questions are compulsory. Draw diagrams wherever necessary. All questions carry **equal** marks. .

1. Attempt **any four** parts of the following : [5X4=20]

   (A) What is operation research (OR)? Describe the various objectives of operation research.

   (B) What is decision making? Explain the condition of certainty and uncertainty.

   (C) What is simulation? Describe its advantages and disadvantages in solving problems.

   (D) Write the mathematical statement of assignment problem.

   (E) Explain the concept of degeneracy in simplex method.

   (F) What are the characteristics of a linear programming model?

2. Write short note on **any four** of the following : [5X4=20]

   (A) Deterministic queues

   (B) CPM

   (C) PERT

   (D) Application areas of linear programming

   (E) Hungarian method of assignment model

   (F) M/M/1 queuing model.

3. Attempt **any two** parts of the following : [10X2=20]

(A) Explain simplex method in detail.

(B) Solve the L.P.P. by graphical method.

Maximise Z = 3a + 2b S.T.

1a + 1b ≤ 4

1a – 1b ≤ 2 and both a and b are ≥ 0.

(C) A mechanic repairs 4 machines. The mean time between service requirements is 5 hours for each machine andforms an exponential distribution. The mean repair time is 1 hour and also follows the samo distribution pattern. Machine down time costs Rs. 25/- per hour and the mechanic costs Rs.55/- per day. Find (a) Expected number of erating machines,(b) the expected down time cost per day, (c) Would it beeconomical to engage two mechanics, each repairing only twomachines?

4. Attempt **any two** parts of the following : [10X2=20]

(A) Explain the Column Minima Method for finding a basic feasible solution for transportation problem.

(B) A company manufactures three products namely X, Yand Z. Each of the product require processing on three machines, Turning, Milling and Grinding. Product X requires10 hours of turning, 5 hours of milling and 1 hour of grinding. Product Y requires 5 hours of turning, 10 hours of milling and 1hour of grinding, and Product Z requires 2 hours of turning, 4hours of milling and 2 hours of grinding. In the comingplanning period, 2700 hours of turning, 2200 hours of milling and 500 hours of grinding are available. The profit contribution of X, Y and Z are Rs. 10, Rs.15 and Rs. 20 per unitrespectively. Find the optimal product mix to maximize the profit using Simplex Method.

(C) Define and explain the significance of Slack variable, Surplus variable, and artificial ariable in linear programming resource allocation model.

5. Attempt **any two** parts of the following : [10X 2=20]

(A) Explain the process of solving a transportation problem. Differentiate between transportation problem and assignment problem.

(B) A manager has 4 jobs on hand to be assigned to 3 of his clerical staff. Clerical staff differs in efficiency. The efficiency is a measure of time taken by them to do various jobs. Themanager wants to assign the duty to his staff, so that the totaltime taken by the staff should be minimum. The matrix given below shows the time taken by each person to do a particular job. Help the manager in assigning the jobs to the personnel.

Jobs.	*Men.(time taken to do job in hours).*		
	X	Y	Z
A	10	27	16
B	14	28	7
C	36	21	16
D	19	31	21

(C) In a departmental store one cashier is there to serve thecustomers. And the customers pick up their needs bythemselves. The arrival rate is 9 customers for every 5 minutesand the cashier can serve 10 customers in 5 minutes. AssumingPoisson arrival rate and exponential distribution for servicerate, find:

(a) Average number of customers in the system.

(b) Average number of customers in the queue or averagequeue length.

(c) Average time a customer spends in the system.

(d) Average time a customer waits before being served.

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