SEMESTER EXAMINATION, 2022-23
YEAR

 Programme – Ist Yr. M.Tech – INFRASTRUCTURE ENGINEERING

Optimization Methods

Duration : 3:00 hrs   **Max Marks: 100**

Note:-Attempt all questions. All Question carry equal marks. In case of any ambiguity or missing data, the same may be assumed and state the assumption mad in the answer.

Q 1. Answer any four parts of the following.

a) Explain the process of developing OR Model.
b) What is graphical method of solving Linear Programming problem? Explain with suitable example
c) Explain duality in linear programming problem with suitable example.
d) Solve following problem with simplex method Max Z=10x+15y+20z Subject to 2x+4y+6z $\leq$ 24 3x+9y+6z $\leq$ 30 x,y,z $\geq$ 0
e) Explain travelling sales-man problem with suitable example.
f) Explain M/M/1 model of queuing in detail with suitable example.

Q 2. Answer any four parts of the following.

a) Explain method of Linear Programming to solve game problem with suitable example.
b) Explain Inventory model of simulation with suitable example.
c) Describe advantages and dis-advantages of simulation in detail.
d) Explain initial feasible methods for solving transportation problem.
e) Give essential characteristics of queuing procedure.
f) At a railway station, only one train is handled at a time. The railway yard is sufficient only for two trains to wait while other is given signal to leave the station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them on an average of 12 per hour. Assuming Poisson arrivals and exponential service distribution, find the steady-state probabilities for the various number of trains in the system. Also find the average waiting time for a new train coming into the yard.

Q 3. Answer any two parts of the following.

a) There is congestion on the platform of Ahmedabad Railway station. The trains arrive at the rate of 30 trains per day. The waiting time for any train to flag-off is exponentially distributed with an average of 36 minutes. Calculate the following: i) The mean queue size. ii) The probability that the queue size exceeds 10.

b) A transistor radio company manufactures models A,B and C which have profit contributions of 8, 15 and 25 respectively. The weekly minimum production requirements are 100 for model A, 150 for model B and 75 for model C. Each type of radio requires a certain amount of time for the manufacturing of component parts, for assembling and packing. Specially a dozen units of model A require three hours of manufacturing, four hours of assembling and one hour of packing. The corresponding figures for a dozen units of model B are 3.5, 5 and 1.5 and for a dozen unit of model C are 5, 8 and 3. During the forthcoming week the company has available 150 hours of manufacturing, 200 hours of assembling and 60 hours of packing time. Formulate the production scheduling problem as a linear programming model.

c) Solve using Simplex Method Maximize $Z = 40X_1 + 80X_2$ Subject to the constraints

$2X_1 + 3X_2 \leq 48$

$X_1 \leq 15$ $X_2 \leq 10$

$X_1, X_2 \geq 0$

Q 4. Answer any two parts of the following.

a) At a service station a study was made over a period of 25 days to determine both the number of automobiles being brought in for service and the number of automobiles serviced. The results are given below. No. of automobiles arriving and serviced : 0 1 2 3 4 5 Frequency of arrivals (days) : 2 4 10 5 3 1 Frequency of daily serviced (days) : 3 2 12 3 4 1 Simulate the arrival/service pattern for a 15 day period and estimate the mean number of automobiles that remain in service for more than a day.
b) Explain the process of developing OR Model.
c) What is graphical method of solving Linear Programming problem? Explain with suitable example.

Q 5. Answer any two parts of the following.

a) Write the dual of the following primal problem: Minimize $Zx = 18x_1 + 10x_2 + 11x_3$
   Subject to the constraints
   $4x_1 + 6x_2 + 5x_3 > 480$,
   $12x_1 + 10x_2 + 10x_3 > 1200$,
   $10x_1 + 15x_2 + 7x_3 < 1500$,
   $x_2 > 50$, $x_1 - x_2 < 0$, And $x_1, x_2, x_3 > 0$.
b) Define simulation. What are the advantages and limitations of simulation model.
c) What do you understand by
 (i) Queue discipline,   (ii) Arrival process and   (iii) Service process.