ME- Civil - Sem-II- Operation Research 20/11/2015

QP Code : 31803

CBSGS **80 Marks** **3 Hours**

Note: 1. Attempt any 4 Questions **2. All questions carry equal (20) marks**
3. Figures to the right indicate marks **4. Attempt sub questions in order**
5. Assume any data, if required, and state them clearly

Q1) a) Write the introduction and procedure of Golden section method. [5]

b) Maximize $Z = 60x - x^2$ in the interval (0,100) with an accuracy of 0.1% by using Fibonacci method, using n = 4. 1101 [7]

c) Write a detail note on "Operations Research" with the help of following points:

i) Definition

ii) Scope of OR

iii) Applications of various OR techniques

iv) Types of OR models [8]

Q2) a) Vehicles arrive at service station in a Poisson fashion at an average rate of 45 minutes. The average time taken for service is 30 min. with exponential distribution. Determine:

i) The chance that a vehicle will be serviced straight away.

ii) The proportion of time the service station is busy.

iii) The average no. of vehicles I the queue and the system.

iv) The average time spent by vehicle waiting in the queue and the system.

v) The probability that there are two vehicles in the queue. [10]

b) Find the sequence that minimizes the total elapsed time required to complete the following tasks on two machines. [10]

Task	A	B	C	D	E	F	G	H	I
Machine I	2	5	4	9	6	8	7	5	4
Machine II	6	8	7	4	3	9	3	8	11

[TURNOVER

Q3) a) State the principal of optimality in dynamic programming. What is recursive equation? How is it solved? [4]

b) Customers arrive at service facility to get the required service. The inter arrival and service times are constant and are 1 .8mm and 4 mm respectively. Simulate the system for 14 mm. Determine average waiting time of a customer and idle time of service facility. [8]

c) Construction equipment is to be transported from place 1 to place 11. The equipment can be transported along different routes. The travel distance along different routes from place 'I' to place 'j' are given below. Use dynamic programming to determine the shortest route between place 1 to place 11. Write the recursive equation for each stage. [8]

Place 'i-j'	Dist. in Km	Place 'i-j'	Dist. in Km
1-2	30	5-8	21
1-3	34	5-9	33
1-4	36	5-10	33
2-5	29	6-8	22
2-6	27	6-9	24
2-7	30	6-10	29
3-5	31	7-8	33
3-6	25	7-9	32
3-7	23	7-10	34
4-5	28	8-11	37
4-6	27	9-11	28
4-7	26	10-11	36

Q4) a) What do you understand by an Assignment model and a Transportation model? How does an Assignment model differ from a Transportation model? Explain the procedure to be followed to solve following types of problems in Transportation model by giving suitable examples.

i) Unbalanced Transportation problem

ii) Maximisation problem [8]

[TURNOVER

b) Two RMC plants are owned by a company with capacity 75 cu. m. and 100 cu. m. per day respectively. It supplies concrete to three sites with requirement 50 cu. m., 60 cu. m. and 65 cu. m. per day respectively. Costs of transportation of concrete per cu.m. from each plant to the sites are as given below:

		sites 1	2	3	supply
plants	A	25	30	35	75
	B	15	28	40	100
demand		50	60	65	

Formulate a LP model to minimise transportation cost. (Do not solve the problem) **[4]**

c) Solve the following Assignment model to minimise cost **[8]**

	1	2	3	4	5
A	4	5	8	9	7
B	6	8	10	12	11
C	9	10	6	8	5
D	10	11	15	12	11
E	12	13	9	8	3

Q5) a) Solve by BIG M method. **[10]**

$$\text{Maximize } Z = 6x_1 - 3x_2 + 2x_3,$$

$$\text{Subject to, } 2x_1 + x_2 + x_3 \le 16,$$

$$3x_1 + 2x_2 + x_3 \le 18,$$

$$x_2 - 2x_3 \ge 8,$$

$$x_1, x_2, x_3 \ge 0.$$