Roll No…… **13260**

OMMS/M-14
MANAGEMENT SCIENCE
Paper: CP-201

Time**:** Three Hours] [Maximum Marks**:** 70

Note: Attempt any five questions. All questions carry equal marks.

1. Write the significance and scope of Operations research in modern management.

2. Based on Integer programming

Maximize $Z = 5_{x1} + 4_{x2}$

subject to

$x_1 + x_2 \geq 5$

$10_{x1} + 6_{x2} \leq 45$

x_1, x_2 non -negative integers.

3. A company has received a contract to supply Sand for three new construction projects located in towns A, B and C. Construction engineers have estimated the required amounts of Sand which will be needed at these construction projects as below :

Project Location	Weekly Requirement (Truck loads)
A	72
B	102
C	41

The company has 3 Sand pits located in town.- X. Y and Z The Sand required by the construction projects can be supplied by three pits. The amount of Sand which can be supplied by each pit is as follows :

Pit	:	X	Y	Z
Amount available (truck loads)	:	76	82	77

The company has computed the delivery cost from each pit to each project site. These costs (in Rs.) are shown in the following table:

Project location

Pit

	A	B	C
X	4	8	8
Y	16	24	16
8	8	16	24

Schedule the shipment from each pit to each project in such a manner so as to minimize the total transportation cost within the constraints imposed by pit capacities and project requirements. Also find the minimum cost.

4. A marketing manager has five salesmen and five sales districts. Considering the capabilities of the salesmen and the nature of districts, the marketing manager estimates that sales per month (in hundred rupees) for each salesman in each district would be as follows :

Districts

Salesman

	A	B	C	D	E
1	32	38	40	28	40
2	40	24	28	21	36
3	41	27	33	30	37
4	22	38	41	36	36
5	29	33	40	35	39

Find the assignment of salesman to districts that will result in maximum sales.

5. A dentist schedules all his patients for 30 –minutes appointments. Some of the patients take more or less than 30 minutes depending on the type of dental work to be done. The following summary shows the various categories of work, their probabilities and time actually needed. to complete the work:

Category of Service	Time Required (Minutes)	Probability of Category
Filling	45	0.40
Crown	60	0.15
Cleaning	15	0.15
Extraction	45	0.10
Check-up	15	0.20

Simulate the dentist's clinic for four hours and determine the average waiting time for the patients as well as the idleness of the doctor. Assume that all the patients show up at the clinic at exactly their scheduled arrival time starting at 8.(X) a.m.

Use the following random numbers for handling the above problem:

40 82 11 34 25 66 17 79.

6. 'GoGreen' Company is evaluating four alternative single –period investment opportunities whose returns are based on the state of the economy. The possible states of the economy and the associated probability distribution is as follows :

State :	Fair	Good	Great
Probability:	0.2	0.5	0.3

The returns for each investment opportunity and each state of the economy are as follows :

Alternative	State of Economy		
	Fair	Good	Great
W	Rs. 1,000	Rs.3,000	Rs. 6,000
X	Rs. 500	Rs. 4,500	Rs. 6,800
Y	Rs. 0	Rs. 5,000	Rs. 8,000
Z	Rs. 4,00	Rs. 6,000	Rs. 8,500

Using Decision -tree approach, determine the expected return for each alternative. Which alternative investment proposal would you recommend if the expected monetary value criterion is to be employed?

7. Two competitors are competing for the market share of the similar product. The pay-off matrix in terms of their advertising plan is shown below :

Competitor A	No Advertising	Medium Advertising	Heavy Advertising
No Advertising	10	5	-2
Medium Advertising	13	12	13
Heavy Advertising	16	14	10

Suggest optimal strategies for the two firms and the net outcome thereof.

8. (a) Critically comment on the assumptions on which PERT/CPM analysis is done for projects.

(b) What are the major limitations of the PERT model? Discuss.