

M. E. (CE) 2ND SEMESTER FINAL EXAMINATION, 2014
OPTIMIZATION IN TRANSPORT PLANNING (CE 1025)

Time 3 hours

Full Marks 100

Answer any FIVE questions

Assume data if necessary

Use Standard Normal Distribution Table as attached if required

[4 x 3½]

1. Discuss on [any Four]

- a) Delphi method
- b) Observer Derived Weighting Technique
- c) Determination of Weight in AHP
- d) Transportation Model
- e) Sample size determination for a traffic speed study

2. Consider the following linear program

Maximize: $Z = 2X_1 - X_2 + X_3 + X_4$

Subject to $X_1 - X_2 - X_3 \geq -1$

$X_1 + X_2 + X_4 = 2$

$2X_1 + X_2 + X_3 \leq 6$

$X_1, X_2, X_3, X_4 \geq 0$

a) Transform the linear program to the standard form [3]

b) Write down the initial basic feasible solution by inspection. [2]

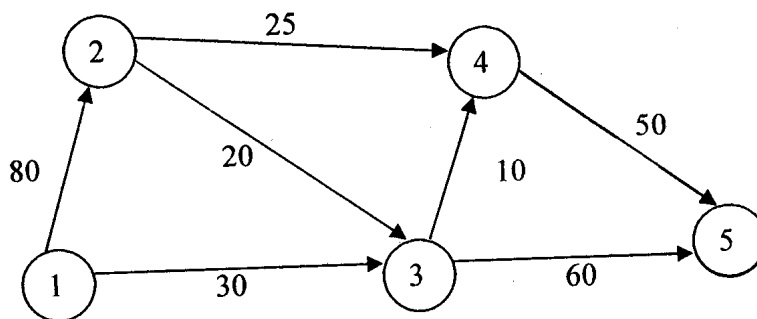
c) Find a feasible solution by increasing the non-basic variable X_1 by one unit keeping other non-basic variables as zero. What will be the net change in the objective function? [2]

d) What is the maximum increase in X_1 possible, subject to the constraints? Find the new basic feasible solution when X_1 is increased to its maximum value. [2]

e) Is the new basic feasible solution is optimal? Give reason. [2]

f) Discuss briefly on Simplex method. [3]

3. (a) The network in the figure below gives the permissible routes and their lengths in kilometer between city 1 (node 1) and four other cities (nodes 2 to 5). Determine the shortest routes from city 1 to each of the remaining four cities by using Dijkstra's Algorithm. [10]



(b) What is the basic difference in Floyd's Algorithm and Dijkstra's Algorithm? [4]

4. Find out the best project from a list of following alternative transportation infrastructure proposals. The proposals are judged on the basis of five criteria. The values of each criterion for each proposal are shown in the following table. The weights of the criteria, in a scale of 1 to 10, for Cost, Average travel speed, Number of important cities connected, Conservation of water resources, and Cultural benefits are 7, 8, 5, 6, 4 respectively. [14]

Criterion → Proposal ↓	Cost (Rs in crore)	Average Travel Speed (km/h)	Number of Important Cities Connected	Conservation of Water Resources	Cultural Benefits*
I	1000	50	9	Good	C
II	600	38	17	Bad	B
III	700	44	14	Very Good	A
IV	800	40	15	Moderate	B

* Best is A and worst is D

5. a) Number of aircraft crash occurs per year follows Poisson distribution with mean 5 per year. [6]
- What is the probability that no major crash will occur in the next year?
 - What is the probability that three crashes will occur in next year?
 - What is the probability that three or less number of crashes will occur?

b) In a users' preference study of 50 respondents, the weights of the criteria are measured in a scale of 1 to 10. For a particular criterion the mean is obtained as 7.2 and standard deviation as 2.1. What is the probability that the weight assigned by any user stands between 6 and 8 if it follows normal distribution? Also determine limits of weights that situate within 90% confidence bound. [4+4]

6. a) In the following table data for average monthly income and average daily trips obtained from home interview survey are given. Establish a relationship of average daily trips as function of average monthly income. State whether data on average monthly income and average trips are well correlated. [10]

Average monthly income (Rupees in thousands)	10	20	30	40	50	60	70	80
Average daily trips	6.7	6.8	7.7	8.4	9.5	9.5	10.1	11.5

b) Define: Joint Probability and Conditional Probability [4]

7. In transportation planning study it was required to quantify 5 subjective attributes, A to E. For that opinion of 100 users were taken. The respondents were asked to compare each pair of attributes once and to indicate which attribute of the pair was considered more important than the other. The following table shows that number of times the attribute in the column has been judged heavier than the attribute in the row by the respondents. With the help of any suitable method assign numerical values to each attribute. Also explain the basis of the method used. [10+4]

	A	B	C	D	E
A	----	76	66	41	35
B	24	----	55	28	60
C	34	45	----	65	80
D	59	72	35	----	30
E	65	40	20	70	----

