

DHANAMANJURI UNIVERSITY

Examination- 2026 (June)

Name of Programme : B.A./ B.Sc. Mathematics
Semester : 6th
Paper Type : Core
Paper Code : CMA-317
Paper Title : Network analysis and Project Management

Full Marks : 80**Pass Marks** : 32**Duration: 3 Hours***The figures in the margin indicate full marks for the questions.*

(Use of a normal calculator is allowed)

1. Choose the correct one and rewrite it from the following: 1 × 3 = 3

- a) The Objective of network analysis is to
 i) Minimize total project cost
 ii) Minimize total project duration
 iii) Minimize production delays, interruption and conflicts
 iv) all of the above.
- b) Network problem have advantage in terms of project
 i) Scheduling
 ii) Planning
 iii) Controlling.
 iv) All of the above
- c) The maximum number of edges in a simple undirected graph with n vertices is
 i) n^2
 ii) $n(n+1)$
 iii) $2n$
 iv) $\frac{n(n-1)}{2}$

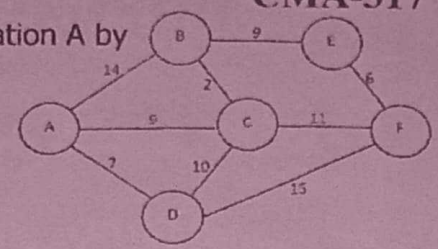
2. Write very short answer for each of the following: 1 × 6 = 6

- a) Define a network in a Project.
 b) Write the full form of PERT in a Project.
 c) What is a cyclic graph?
 d) When a graph is said to be minimal spanning tree?
 e) What is a travelling salesman problem?
 f) Define Network scheduling.

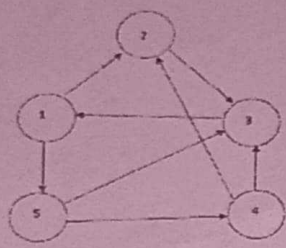
3. Answer any five from the following questions: 3 × 5 = 15

- a) Explain the following terms used in PERT:
 i) Pessimistic time
 ii) Optimistic time
 iii) Most likely time
- b) What is a Critical path in a network?
 c) Write down the basic difference between PERT and CPM.
 d) Prove that a tree G with n vertices has $n-1$ edges.
 e) Show that the number of vertices of odd degree is always even.
 f) Write the augmenting path algorithm.

g) Find the shortest path of each station from station A by Dijkstra's algorithm



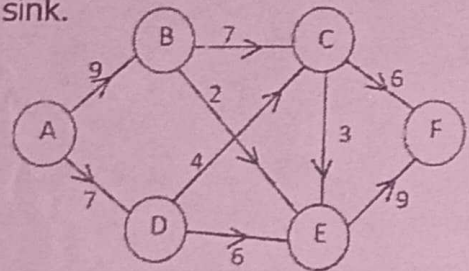
h) Consider the network Determine:
 i) A path
 ii) A cycle
 iii) A spanning tree



4. Answer any five from the following questions:

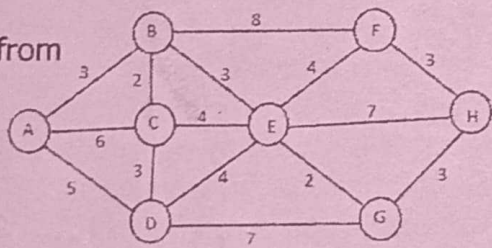
4 x 5 = 20

- a) Write the objectives of Project Management.
- b) Write a short note on monte-Carlo Simulation?
- c) Explain PERT Procedure.
- d) Write the Dijkstra's shortest path Algorithm.
- e) Show that G is a tree if and only if there is one and only one path between every pair of vertices.
- f) State Fulkerson's rule for numbering the nodes in a network.
- g) For the network illustrated below, determine the flow pattern that achieves the maximum flow by applying the augmenting path method, where node A acts as the source and node F as the sink.



15

h) Find the shortest path of each station from station A by using Dijkstra's algorithm



5. Answer any one of the following questions:

12 x 1 = 12

a) A small project is composed of activities whose time estimate is listed in the table below. Activities are identified by their beginning (i) and ending (j) node numbers

Activity(i-j)	Optimistic Time	Most likely Time	Pessimistic Time
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14

4-6	2	5	8
5-6	3	6	15

- Draw the project network.
- Find the expected duration and variance for each activity. What is the expected project length?
- Calculate the variance and standard deviation of the project length. What is the probability that the project will be completed
 - at least 4 weeks earlier than expected?
 - no more than 4 weeks later than expected time?

Given:

Z	0.5	0.67	1.00	1.12	1.33	2.00
σ	0.1915	0.2486	0.3413	0.3686	0.4082	0.4772

- A project has the following time schedule: optimistic time (a), the most likely time (m) and the pessimistic time (b). Draw the network of the project and find the probability of completing the project in 35 days.

Activity	1-2	1-3	2-5	3-4	4-5	5-8	4-6	4-7	6-9	8-9	7-10	9-10
a	3	1	6	8	0	5	6	3	1	3	8	2
m	5	2	8	12	0	7	9	6	2	5	15	5
b	7	3	12	17	0	9	12	8	3	8	20	6

Given:

Z	0.5	0.67	1.00	1.33	0.75
σ	0.1915	0.2486	0.3413	0.4082	0.2734

6. Answer any one of the following questions: $6 \times 1 = 6$

- Write the algorithm for the determination of the critical path.
- Consider the following data for the activities of a project:

Activity	A	B	C	D	E	F
Immediate predecessors	---	A	A	B,C	---	E
Duration(days)	2	3	4	6	2	8

Draw the network and find the critical path.

7. Answer any one of the following questions: $12 \times 1 = 12$

- A travelling salesman has planned to visit 5 cities, he would like to start from a particular city, visit each city once and return to the starting city. The travelling cost in rupees is given in the table below. Find the least cost.

	A	B	C	D	E
A	*	7	5	3	5
B	7	*	8	4	3
C	5	8	*	6	2
D	3	4	6	*	2
E	5	3	2	2	*

- Philips India is engaged in manufacturing different types of equipment for various consumers. The company has two assembly lines to produce its product. The processing time for each of the assembly lines regarded as a random variable and is describe by the following distribution:

Processing time (min)	Assembly X	Assembly Y
40	0.10	0.20
42	0.15	0.40
44	0.40	0.20
46	0.10	0.15
48	0.25	0.05

Using the following random number, generate data on the processing time for 10 units of the product and compute the expected processing time for the product.
4853, 5210, 8221, 7573, 1252, 1283, 4561, 3579, 2014 and 7946.

For the purpose, the first two digits for the processing time on assembly X and the last two digits for the time on processing assembly Y.

c) Define Simulation. Explain the general procedure of monte-Carlo simulation.

8. Answer any one of the following questions:

6 × 1 = 6

a) A company manufactures 30 items per day. The sale of these items depends upon demand, which has the following distribution.

Sales (units)	27	28	29	30	31	32
Probability	0.10	0.15	0.20	0.35	0.15	0.05

2680

The production cost and the sale price of each unit are Rs.40 and Rs.50 respectively. Any unsold product is to be disposed of at a loss of Rs. 15 per unit. There is a penalty of Rs. 5 per unit if the demand is not met. Using the following random numbers, estimate total profit/loss for the company for the next 10 days: 10, 99, 65, 99, 95, 01, 79, 11, 16, 20.

b) The Midwest T.V cable network company is in the process of providing cable services to eight new housing development areas. The below figure depicts the potential T.V linkage among the eight areas. The cable miles are shown on each branch. Determine the most economical cable network for the Midwest Company using the minimal spanning tree algorithm

