D 125444 **(Pages : 4)** **Name.....**

Reg. No.....

SECOND SEMESTER M.B.A. (REGULAR) DEGREE EXAMINATION
JULY 2025

(CUCSS)

M.B.A.

BUS2C13—OPERATIONS RESEARCH

(2024 Scheme)

Time : Three Hours Maximum : 60 Marks

Part A

Answer **all** *questions, each question carries* 2 *marks.*

1. Define Slack and Surplus variables.
2. Define Basic Feasible Solution in Transportation Model.
3. Describe Decision making under Risk.
4. Describe Steady and Transient State queuing systems.
5. Describe Activity and Node. Describe the types of Activities.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions from this Part.*
Each question carries 4 *marks.*

6. A company produces two types of hats. Each of the first type of hat requires twice as much labour time as the second type of hat. If all the hats are of the second type only, the company can produce 500 hats a day. The market limits daily sales of the first and second types to be 150 and 250 hats respectively. Assuming that the profit per hat are Rs. 8 for type 1 and Rs. 5 for type II, formulate the problem as an LPP in order to determine the number of hats to be produced of each so as to maximise the profit.
7. Describe the steps of Hungarian Method to solve an Assignment Problem.

Turn over

8. Describe the criteria for decision making under Uncertainty.

9. Describe the Principle of Dominance with examples.

10. In a railway yard, goods train arrive at a rate of 30 trains per day. Assuming that the interarrival time and service time (with mean 36 min.) follow exponential distribution, calculate (a) The mean queue size ; (b) Probability that the queue size exceeds 10 ; and (c) If the trains arrive at a higher rate (33 per day), What will be the changes in the results of (a) and (b).

11. Differentiate between CPM and PERT with applications.

(4 × 4 = 16 marks)

Part C

Answer any **three** *questions from this Part.*
Each question carries 8 *marks.*

12. Solve using Simplex method :

Maximise, $z = 6x_1 + 4x_2$

subject to $-2x_1 + x_2 \leq 2$

$x_1 - x_2 \leq 2$

$3x_1 + 2x_2 \leq 9$

$x_1 \geq 0$

$x_2 \geq 0.$

13. Solve the Transportation problem using VAM.

Destinations

Origins	d_1	d_2	d_3	*Availability*
o_1	2	7	4	5
o_2	7	3	1	8
o_3	5	4	7	7
o_4	1	6	2	14
Demand	7	9	18	34

14. The manager of a flower shop promises its customers delivery within four hours on all flower orders. All the flowers are purchased on the previous day and delivered to customers by 8.00 am the next morning. The daily demand for roses are :

Roses	:	70	80	90	100
Probability	:	0.1	0.2	0.4	0.3

The manager purchases roses for Rs. 1 per rose and sells at Rs. 3. All unsold roses are donated to a local hospital. What is the manager's optimum order quantity and optimum profit ?

15. Describe the concept of Simulation. Explain the process with an example.

16. A project schedule is given below. Find the critical path and project duration. (Time in days) :

Activity	*Time*	*Activity*	*Time*
1 - 2	4	5 - 6	4
1 - 3	1	5 - 7	8
2 - 4	1	6 - 8	1
3 - 4	1	7 - 8	2
3 - 5	6	8 - 10	5
4 - 9	5	9 - 10	7

(3 × 8 = 24 marks)

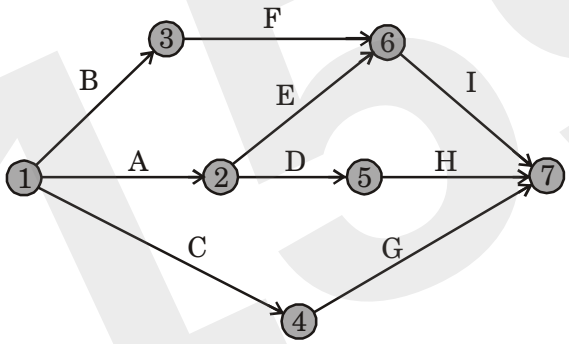
Part D

Compulsory Question, 10 *marks.*

17. A project is represented by the network shown below and has the following data :

Task (*times in weeks*)	A	B	C	D	E	F	G	H	1
Optimistic time, t_o	5	1 8	2 6	1 6	1 5	6	7	7	3
Pessimistic time, t_p	1 *x*	2 2	4 0	2 0	2 5	1 2	1 2	9	5
Most likely time, t_m	8	2 0	3 3	1 8	2 0	9	1 0	8	4

Turn over



Determine the following :

- Critical path.
- Probability that the project is completed in : (a) 41.5 weeks ; (b) 40 weeks ; (c) 48 weeks.
- The project duration that has a chance of (d) 60 %

(10 marks)