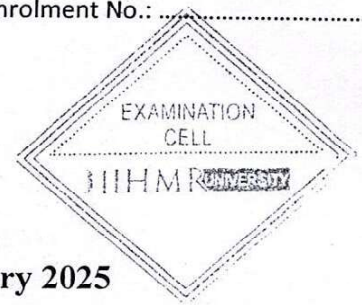




Time - 3 Hours

Maximum Marks: 50 (Minimum Marks 20)

Instructions to students:

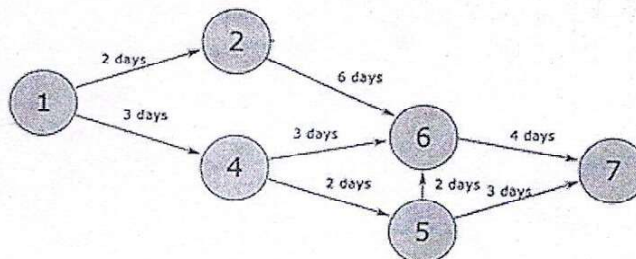
- This question paper contains 4 printed pages.
- Don't write anything on the Question Paper except writing your Enrolment No.

Part A

(Maximum Marks: 5)

Q1. Choose the correct option for the following (1 mark each):

- (A) The project duration (length of critical path) in the network diagram below is:



- a) 10 days
b) 11 days
c) 12 days
d) 14 days
- (B) Consider the following linear programming

Maximize Z (profit) = $1200x_1 + 600x_2$

Subject to

$200x_1 + 400x_2 \leq 1600000$ (administrative support constraint)

$500x_1 + 300x_2 \geq 1500000$ (contribution margin constraint)

$1x_1 + 0x_2 \leq 5000$ (enrollees constraint)

$x_1, x_2 \geq 0$

The number of decision variables are

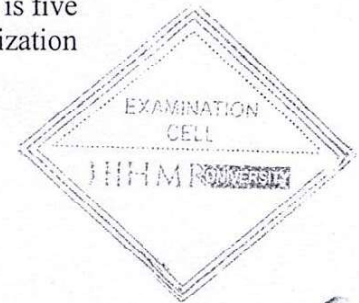
- a) 2
b) 3
c) 4
d) None of the above

- (C) The method used for solving an assignment problem is called
- Reduced matrix method
 - MODI method
 - Hungarian method
 - None of the above
- (D) An OB/GYN clinic has the following yearly patient visits and would like to predict the volume of business for the next year for budgeting purposes.

Period(t)	Age	Visits
1	5	15,908
2	4	15,504
3	3	14,272
4	2	13,174
5	1	10,022

The volume of business (visit) for next period (6) using 3 period moving average would be

- 10,022
 - 11489
 - 10489
 - 12489
 -
- (E) In a particular single server system, the arrival rate of patients is five per hour and the service rate is eight per hour. The system utilization is:
- 0.425
 - 0.525
 - 0.625
 - 0.725



Part B

(Maximum Marks: 15)

Answer any three of the following questions (5 marks each):

- Q2. What do you understand by Operations Management. Explain in brief, important techniques which could be applied in hospitals.
- Q3. Explain the LP structure of assignment and transportation model, explaining decision variables, objective function, and constraints.
- Q4. A hospital is evaluating the feasibility of offerings among three technologies, on the basis of what would make the most profit. These new technologies are:
- Closed - chest cardiac bypass surgery with "daVinci Surgical Robot"
 - Gamma knife
 - Positron emission tomography (PET) scanner

The table below gives the information on profit, the amount of common resources used by each of the three technologies per case, and their available resources per month:

	daVinci	Gamma Knife	PET	Available Resources
Profit \$	2,000	3,500	2,000	
Total staff time	15	12	1.5	2,000 hours
Maintenance	25	25	22	1,500 minutes
Computer resources	20	25	10	3,000 minutes

Formulate this as a linear programming problem by clearly identifying the decision variables.

- Q5. Explain EOQ method used in inventory management.
- Q6. Explain the Cost Profit Volume analysis and Factor rating methods in making informed decisions in location selection.

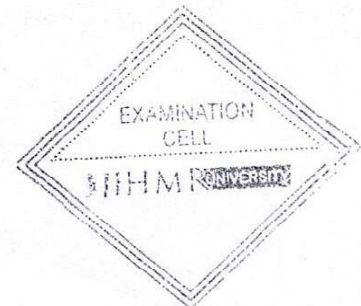
Part C

(Maximum Marks: 30)

Answer any three of the following questions in detail (10 marks each):

- Q7. Table below shows the precedence relationships among the activities to complete a health project.

Activity	Predecessor	Duration (days)
A	—	18
B	A	19
C	A	17
D	B	15
E	C	18
F	D	13
G	E	17
H	F, G	12



Draw the arrow diagram, and analyze the activities early start and latest finish times. Also determine the float for each activity.

- Q8. Given the following linear programming formulation:

Maximize

$$1,600 x_1 + 3,000 x_2$$

Subject to:

$$40 x_1 + 25 x_2 \leq 80,000 \text{ (constraint1)}$$

$$20 x_1 + 30 x_2 \leq 60,000 \text{ (constraint2)}$$

$$x_1, x_2 \geq 0 \text{ (non-negativity constraints).}$$

Solve the problem graphically, and find out the total objective function value?
Do both variables contribute to the solution? Why? Does any variable have a slack value? If so, what does it mean?

- Q9. Table below shows the details of annual usage ten products in a health organization.

Product ID	Unit price (Rs.)	No. of units per year
1	5	1000
2	10	10
3	7	5
4	750	100
5	5	2000
6	1	150
7	8	1500
8	6	10000
9	30	20
10	4	9000

For inventory control reasons the organization wants to classify the products into three categories A, B, and C according to the following basis.

Category	Percentage of total ACV
A	70
B	20
C	10

Classify the products into A, B, and C categories and draw the ABC classification graph.

- Q10. Explain the various qualitative and quantitative techniques of predictive analytics (forecasting).
- Q11. Explain Queuing & Capacity Planning in Hospitals. Explain the server utilization, line length, queue length, wait in queue and in system for single server model. Also explain the queue cost analysis.

