(8 pages) **Reg. No. :** .....

Code No. : 6319 **Sub. Code : PMAM 34**

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2021

Third Semester

Mathematics — Core

OPERRATIONS RESEARCH

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer:

1. The starting basic feasible solution consists of _____ variables.

(a) $m+n-1$ (b) $m+n+1$

(c) $m+n-2$ (d) None

2. The supply amount at each source and the demand amount at each destination exactly equals 1 is _____

(a) Transportation model

(b) Assignment model

(c) Both (a) and (b)

(d) None

3. Traffic intensity ρ = _____

(a) $\mu\lambda$ (b) $\frac{\mu}{\lambda}$

(c) $\frac{\lambda}{\mu}$ (d) $\lambda - \mu$

4. λ_{eff} is _____

(a) $< \lambda$ (b) $\leq \lambda$

(c) $= \lambda$ (d) λ lost

5. Which operation is used in Floyd's algorithm

(a) one (b) double

(c) triple (d) None

6. To find shortest route between two given nodes in a network we use

(a) Hungarian method

(b) Dijikstra's algorithm

(c) Floyd's Alogorithm

(d) Maximal Flow algorithm

7. In the fractional cut we have taken only _____ fractions.

(a) Positive (b) Negative

(c) Improper (d) None

8. _____ algorithm is the first special 0 – 1 algorithm.

(a) Binary (b) Zero-one

(c) additive (d) multiplicative

9. When the inventory drops to a certain level, the order placed is called

(a) periodic point (b) price break point

(c) re order point (d) both (b) and (c)

10. If the product has been brought with a discount the inventory policy follows

(a) classic EOQ model

(b) probabilistic EOQ model

(c) EOQ with price breaks

(d) multiple EOQ

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Find the Initial basic feasible solution by the Vogel's Approximation method.

5	1	7	10
6	4	6	80
3	2	5	15
75	20	50	

Or

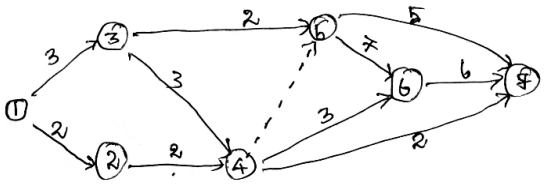
(b) Solve the assignment problem

	1	2	3	4
I	1	4	6	3
II	9	7	10	9
III	4	5	11	7
IV	8	7	8	5

12. (a) A hiker has a 5 ft^3 backback and needs to desire onto most valuable items to take on hiking trip. There are three items from which to choose. Their volumes are 2, 3 and 4 ft^3 and the hiker estimates their associated value on a scale from 0 – 100 as 30, 50 and 70 respectively. Express the problem as the longest route network and find the optimal solution.

Or

(b) Find the Critical path for the following network :



13. (a) Solve the following IPP

$$\text{Max } z = 7x_1 + 10x_2$$

sbt

$$x_1 + 2x_2 \le 10$$
$$3x_1 + x_2 \le 15$$
$$x_1, x_2 \ge 0 \text{ integers.}$$

Or

(b) Explain Branch and Bound Algorithm.

14. (a) Given that $EOQ = 1000, D = 100, \sigma = 10,$ $\alpha = 0.05$ and $L = 8$. Find μ_L, σ_L and the lower limit of buffer size.

Or

(b) Determine the optimal inventory policy and the associated cost per day in which no shortage is allowed and the lead time is 30 days. Also given that k = \$100, h = \$0.05 and D = 30 units per day.

15. (a) Explain pure birth model.

Or

(b) If $(M/M/1):(GD/\infty/\infty)$ model, find L_s, W_s, and W_q.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a)

10	2	20	11	15
12	7	9	20	25
4	14	16	18	10
5	15	15	15	50

Given $x_{12} = 15, x_{23} = 15, x_{24} = 10, x_{22} = 0,$ $x_{31} = 5$ and $x_{34} = 5$. Is it an optimal solution to the transportation problem.

Or

(b) Solve the assignment problem using Hungarian method.

	A	B	C	D	E
I	3	8	2	10	3
II	8	7	2	9	7
III	6	45	2	3	5
IV	8	4	2	3	5
V	9	10	6	9	10

17. (a) Explain man-flow algorithm.

Or

(b)

Activity	Predecessor	a	m	b
A	–	5	6	7
B	–	1	3	5
C	–	1	4	7
D	A	1	2	3
E	B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E, F	4	4	10
I	D	2	5	8
J	H, G	2	2	8

(i) Compute the project network.

(ii) Find the expected duration and variance of each activity.

(iii) Find the critical path and expected project completion time.

(iv) What is the probability of completing the project on or before 22 weeks?

18. (a) Solve the following integer programming problem to Branch and Bound technique :

$\text{Max } z = 10x_1 + 20x_2$

sbt to

$6x_1 + 8x_2 \leq 48$

$x_1 + 3x_2 \leq 12$

$x_1, x_2 \geq 0$ integers.

Or

(b) Explain Gomory's cutting plane algorithm.

19. (a) The following data describe 3 inventory items. Determine the optimal order quantities.

Item i	ki $	Di unit/day	hi ($)	ai (ft_2)
1	10	2	.3	1
2	5	4	.1	1
3	15	4	.2	1

Total available storage area = 25 ft^2.

Or

(b) Explain classic EOQ model.

20. (a) Explain $(M/M/1):(GD/N/\infty)$, Also find λ_{eff} .

Or

(b) Explain multiple serve/model $(M/M/C):(GD/\infty/\infty)$.

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