K24U 0735

Reg. No. : ....

Name : ....

IV Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, April 2024
(2019 to 2022 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN MATHEMATICS
4C04 MAT-CS : Mathematics for Computer Science – IV

Time : 3 Hours Max. Marks : 40

PART – A

Answer **any 4** questions from this Part. **Each** question carries **1** mark. **(4×1=4)**

1. Define a graph isomorphism.
2. Draw a 3-regular graph on 6 vertices.
3. What is meant by optimal solution to an LPP ?
4. What is the necessary and sufficient condition for the existence of a feasible solution to a transportation problem ?
5. State the trapezoidal rule for finding an approximate area under a given curve.

PART – B

Answer **any 7** questions from this Part. **Each** question carries **2** marks. **(7×2=14)**

6. Define a complete graph. Find a formula for the number of edges of a complete graph on n vertices.
7. Show that in any graph G, the number of odd degree vertices must be even.
8. Define adjacency matrix of a graph. Write any three properties of adjacency matrix of a simple graph.
9. Prove that a simple graph G and its complement $\bar{G}$ cannot both be disconnected.

P.T.O.

10. Reduce the following LPP to its standard form.

    Maximize $z = x_1 - 3x_2$

    Subject to the constraints $-x_1 + 2x_2 \leq 15$, $x_1 + 3x_2 = 10$

    x_1 and x_2 unrestricted in sign.

11. State the fundamental theorem of linear programming.

12. Explain the North-West corner method to solve a transportation problem for an initial solution.

13. Explain transportation problem and show that it can be considered as an LPP.

14. Estimate the error of the trapezoidal formula.

15. Approximate the integral $\int_0^2 x^3 dx$ using Simpson's $\frac{1}{3}$ rule with two sub intervals.

PART – C

Answer **any 4** questions from this Part. **Each** question carries **3** marks. **(4×3=12)**

16. A simple graph G is called self-complementary if it is isomorphic to its complement. Then
    a) Draw a self-complementary graph.
    b) Prove that if G is a self-complementary graph on n vertices then n is either 4k or 4k + 1 for some integer k.

17. a) Define distance d(x, y) between two vertices x and y in a connected simple graph G.
    b) Show that $d(x, y) \leq d(x, z) + d(z, y)$ for any three vertices x, y and z in a connected simple graph.
    c) Find the radius and diameter of the Peterson graph.

18. Describe the general linear programming problem in :
    a) Standard form
    b) Canonical form.

19. Let $x_1 = 2$, $x_2 = 4$ and $x_3 = 1$ is a feasible solution to the system of equations

$2x_1 - x_2 + 2x_3 = 2$

$x_1 + 4x_2 = 18$

Reduce the given feasible solution to a basic feasible solution.

20. Determine an initial basic feasible solution to the following transportation problem using Vogel's approximation method :

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

21. Given $\frac{dy}{dx} = x - y^2$ and y(0) = 1, obtain Taylor's series for y(x). Find y(0.1) correct to 4 decimal places.

22. Solve by modified Euler's method, the problem $\frac{dy}{dx} = x + y$, y(0) = 0. Choose h = 0.2 and compute y(0.2) and y(0.4).

PART – D

Answer **any 2** questions from this Part. **Each** question carries **5** marks. **(2×5=10)**

23. Use graphical method to solve the LPP :

Maximize $z = 2x_1 + x_2$

Subject to the constraints $x_1 + 2x_2 \leq 10$, $x_1 + x_2 \leq 6$, $x_1 - x_2 \leq 2$, $x_1 - 2x_2 \geq 10$, $x_1 \geq 0$ and $x_2 \geq 0$.

24. Using simplex method to solve the LPP :

Maximize $z = 5x_1 + 4x_2$

Subject to the constraints $4x_1 + 5x_2 \leq 10$, $3x_1 + 2x_2 \leq 9$, $8x_1 + 3x_2 \leq 12$, $x_1 \geq 0$ and $x_2 \geq 0$.

25. Solve the following transportation problem :

	D_1	D_2	D_3	D_4	**Available**
O_1	5	3	6	2	19
O_2	4	7	9	1	37
O_3	3	4	7	5	34
Requirement	16	18	31	25	

26. Using fourth order Runge-Kutta formula, find y(0.2) and y(0.4) given that

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}, y(0) = 1.$$