SUB.CODE: 20PCA2C7

REG.NO:

DHANALAKSHMI SRINIVASAN COLLEGE OF ARTS & SCIENCE FOR WOMEN (AUTONOMOUS)

(For Candidates admitted from 2020-2021 onwards)

PG DEGREE EXAMINATIONS APRIL - 2021

M.C.A – COMPUTER APPLICATION

OPERATION RESEARCH AND NUMERICAL METHODS

Time: 3 Hrs **Max.Marks: 75**

PART - A

CHOOSE THE CORRECT ANSWER **(10X1=10)**

1. When solving a LP model graphically, the area bounded by the constraints is

   a) Feasible region b) Infeasible region c) Bounded solution d) Unbounded solution

2. In a linear programming, all relationships among decision variables are

   a) Positive b) Negative c) Inequality d) Integers

3. The number of basic variables of the general transportation problem at any stage of feasible solution must be

   a) $m+n+1$ b) $m+n-1$ c) $m-n+1$ d) $m-n-1$

4. The method used for solving an assignment problem is

   a) Reduced matrix method b)Modi method c) Hungarian method d) Graphical method

5. By Gaussian elimination method the coefficient matrix is reduced to

   a) upper triangular matrix b) lower triangular matrix

   c) diagonal matrix d) triangular

6. Simultaneous displacements are made in

   a) Gauss –seidel method b) Gauss –Jodan method

   c) Gauss –Jacobi method d) Gauss elimination method

7. Trapezoidal rule for $\int_{x_0}^{x_n} y\,dx$ is

   a) $h[y_0+2(y_1+y_2+\ldots+y_{n-1})+y_n]$ b) $\frac{h}{2}[y_0+2(y_1+y_2+\ldots+y_{n-1})+y_n]$

   c) $\frac{h}{3}[y_0+2(y_1+y_2+\ldots+y_{n-1})+y_n]$ d) $\frac{2h}{3}[y_0+2(y_1+y_2+\ldots+y_{n-1})+y_n]$

8. This rule requires the division of the whole range into an even number of sub-intervals of width h

   a) Trapezoidal rule b) Simpson's 1/3 rule

   c) Newton's forward formula d) Newton's backward formula

9. The formula for y_1 in R.K. II order formula is:

a) $y_0 + \frac{1}{2}[hf(x_0, y_0) + hf(x_0 + h, y_0 + k_1)]$

b) $y_0 - \frac{1}{2}[hf(x_0, y_0) + hf(x_0 + h, y_0 + k_1)]$

c) $y_0 + \frac{1}{2}\left[hf(x_0, y_0) + hf(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2})\right]$

d) $y_0 + \frac{1}{2}[f(x_0, y_0) + f(x_0 + h, y_0 + k_1)]$

10. Runge- kutta method is used to solve

a) Integral equation

b) Differential equation

c) Simultaneous equation

d)Transcendental equation

PART- B

ANSWER ALL THE QUESTIONS **(5X7=35)**

11. a) A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes namely suitings, shirtings and woolens yielding a profit of Rs. 2, Rs. 4 and Rs.3 per metre respectively. One metre of suiting requires 3 minutes in weaving, 2 minutes in processing and 1 minute in packing. Similarly one metre of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing. One metre of woolen requires 3 minutes in each department. In a week, total run time of each department is 60,40 and 80 hours for weaving, processing and packing respectively. Formulate the linear programming problem to find the product mix to maximize the profit.

(OR)

b) Solve the following LPP using the graphical method

Maximize $z = 2x_1 + 3x_2$

Subject to the constraints : $x_1 + x_2 \leq 30, x_1 - x_2 \geq 0, x_2 \geq 3,$

$0 \leq x_1 \leq 20$ and $0 \leq x_2 \leq 12$

12. a) Find the initial basic feasible solution to the following Transportation problem using North West Corner rule.

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

(OR)

b) Solve the following assignment problem by using Hungarian method.

	MEN		
Task	A	B	C
1	9	26	15
2	13	27	6
3	35	20	15
4	18	30	20

13. **a)** Solve the following system of equations by Gauss Elimination method.

$2x + y + z = 10$

$3x + 2y + 3z = 18$

$x + 4y + 9z = 16$

(OR)

b) Solve the following system of equations by Gauss Jordan method

$10x + y + 4 = 12$

$2x + 10y + z = 13$

$x + y + 5z = 7$

14. a) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using the trapezoidal rule with h = 0.2

(OR)

b) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\, d\theta$ using Simpson's rule taking 6 equal parts

15. a) Solve the equation $\frac{dy}{dx} = x + y$ with y(0) = 0, Using Euler's method and Compute $y(0.4)$ and $y(0.6)$

(OR)

b) Solve the equation $\frac{dy}{dx} = y - x$ with y (0) = 2, find the initial value of y(0.1) and y(0.2) by Runge-kutta second order formula.

PART-C

ANSWER ANY THREE QUESTIONS **(3X10=30)**

16. Use simplex method to solve the following LPP Maximize $Z = 4x_1 + 10x_2$ subject to constraints $2x_1 + x_2 \leq 50, 2x_1 + 5x_2 \leq 100, 2x_1 + 3x_2 \leq 90; x_1 \geq 0 \text{ and } x_2 \geq 0$

17. Obtain an initial basic feasible solution by Vogel's Approximation method for the following Transportation problem (Pg No 257)

	D_1	D_2	D_3	D_4	Supply
S_1	20	25	28	31	200
S_2	32	28	32	41	180
S_3	18	35	24	32	110
Demand	150	40	180	170	

18. Solve the following system of equations by Gauss – seidel method.

$4x + 2y + z = 14$

$x + 5y - z = 10$

$x + y + 8z = 20$

19. The table gives the angular displacement θ(radians) at different intervals of time 't' (sec)

θ	0.052	0.105	0.168	0.242	0.327	0.408	0.489
t	0	0.02	0.04	0.06	0.08	0.10	0.12

Calculate the angular velocity at the instant t = 0.02.

20. Use Runge-Kutta fourth order formula to compute y when x = 1 given that y(0) = 1 with h = 0.1 and $\frac{dy}{dx} = \frac{y - x}{y + x}$.