LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **MATHEMATICS**

FOURTH SEMESTER – **APRIL 2019**

16/17PMT4MC02– NUMERICAL METHODS USING C++

Date: 08-04-2019 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Answer all the questions. Each question carries 20 marks.

I.a.1. Find the real root of the equation $x^2 + 4\sin x = 0$ correct to 3 decimal places by Newton-Raphson's method.

OR

a.2.Find to 4 places of decimals the smaller root of the equation $e^{-x} - \sin x = 0$ **(3)**

b.1. Solve $x^3 - 8x^2 + 17x - 10 = 0$ by Graeffe's method.

b.2. Find the real root of the equation $x^3 - 2x - 5 = 0$ by regulafalsi method correct to 3 decimal places.

(5+12)

OR

c. Using bisection method, find the negative roof of $x^3 - x - 11 = 0$ correct to 4 decimal places.

(17)

II. a.1.What is a pivot element and why do we have to rearrange the equations?

OR

a.2.What is the difference between Gauss elimination, Gauss-Jordan, Gauss Jacobi and Gauss –Seidel method. Explain briefly. **(3)**

b. Solve by Gauss-Jacobi method: $8x - 3y + 2z = 20$; $6x + 3y + 12z = 35$ and $4x + 11y - z = 33$

(17)

OR

c. Using Gauss-Seidel iteration method, solve the system of equations:

$10x - 2y - z - w = 3$; $-2x + 10y - z - w = 15$; $-x - y + 10z - 2w = 27$; $-x - y - 2z + 10w = -9$.

(17)

III. a.1. The following table gives the values of density of saturated water for various temperatures of saturated steam.

Temp^oC = (T)	100	150	200	250	300
Density hg/m3 (=d)	958	917	865	799	712

Find by interpolation, the densities when the temperatures are 275^oC respectively.

OR

a.2. Using Newton's interpolation formula and the values given in the table, calculate $\sin 52^o$.

x^o	45	50	55	60
$\sin x^o$	0.7071	0.7660	0.8192	0.8660

(3)

b.1. Use Lagrange's formula to find the form of f(x), given

x	0	2	3	6
f(x)	648	704	729	792

b.2. Using Gauss's forward interpolation formula, find the value of log 337.5 from the following table:

x	310	320	330	340	350	360
log x	2.4914	2.5051	2.5185	2.5315	2.5441	2.5563

(7+10)

OR

c.1. Apply Bessel's formula to obtain y_{25}given that y_{20} = 2854,y_{24}= 3162, y_{28}= 3544 and y_{32} = 3992 .

c.2. Use Laplace-Everett's formula to obtain f(1.15) given that

f(1) = 1.000, f(1.10)= 1.049, f(1.20) = 1.096, f(1.30) = 1.140. **(8+9)**

IV. a.1. Given the following data, find the maximum value of y :

x	-1	1	2	3	
y	-21	15	12	3	

OR

a.2. A curve is drawn to pass through the following points:

x	1	1.5	2	2.5	3	3.5	4
y	2	2.4	2.7	2.8	3	2.6	2.1

Estimate the area bounded by the curve, x- axis and lines x = 1 and x= 4**.** **(3)**

b.1. When do you apply simpson's 1/3 and 3/8th rules.

b.2. Evaluate $\int_0^{10} \frac{1}{1+x^2} dx$ by using (i) Trepezoidal rule, (ii) Simpson's 1/3rd rule, (iii) Simpson's 3/8th rule and (iv)Weddle's rule. Compare the results with the actual value. **(4+13)**

OR

c. 1. Obtain the value of f ′ (90) using Stirling's formula to the following data:

x	60	75	90	105	120
f(x)	28.2	38.2	43.2	40.9	37.7

Also find the maximum value of the function from the data.

c.2. Using Bessel's formula, find the derivative of f(x) at x = 3.5 from the following table:

x	3.47	3.48	3.49	3.50	3.51	3.52	3.53
f(x)	0.913	0.915	0.918	0.201	0.203	0.206	0.208

(8+9)

V. a.1. State the formula to find successive approximation by Picard's method.

OR

a.2.State the predictor and corrector in predictor –corrector methods. **(3)**

b. Solve $\frac{dy}{dx} = y - \frac{2x}{y}$, y(0) = 1 in the range $0 \le x \le 0.2$ using (i) Euler's method, (ii) improved Euler's method and (iii) modified Euler's method by choosing h= 0.1. Compare the answers. **(17)**

OR

c. Given $\frac{dy}{dx} = x^2 - y$, y(0) =1 , find y(0.1), y(0.2) using Runge-Kutta methods of (i) second order, (ii) third order and (iii) fourth order. **(17)**