

END OF SEMESTER EXAMINATIONS, NOVEMBER - 2017

SKILL BASED PAPER: NUMERICAL METHODS

SUBJECT CODE: 12UEMA01

MAJOR: B.Sc. MATHS

TIME : 3 HOURS

SEMESTER : VI

MAX. MARKS: 75

SECTION - A (5 X 2 = 10)Answer ALL the questions:

- Write the formula for i) Chord method, ii) Newton Raphson method.
(OR)
- Find the interval in which the smallest positive root of the equation $x^3 - x - 4 = 0$ lies.
- Write the following operators.
i) the backward difference operator.
ii) the central difference operator.
(OR)
- Write i) Gauss central difference formula (Forward).
ii) Everett's formula.
- Name the error's in Numerical differentiation.
(OR)
- Write the errors of Simpson's rule and Simpson's $\frac{3}{8}$ rule.
- Explain matrix inversion method.
(OR)
- Name any 2 direct methods.
- Define Initial value problem with example.
(OR)
- Define Fourth order R-K method.

SECTION - B (5 X 4 = 20)Answer ALL questions:

- Perform 5 iterations of the bisection method to obtain the root of $x^3 - 5x + 1 = 0$.
(OR)
- Find by Newton Raphson method for $N^{1/3}$, N is the positive real number. Also find the results in two decimal places when $N = 18$.
- Show that i) $\delta = \nabla(1 - \nabla)^{-1/2}$; ii) $\mu = \left(1 + \frac{\delta^2}{4}\right)^{1/2}$
(OR)
- Using Lagrange's interpolation formula find $f(x)$ from the table:

x :	0	1	3	4
f(x):	-12	0	12	24
- A solid revolution is formed by rotating about the x -axis the area between the x -axis, $x = 0$, $x = 1$ and a curve through the points with the following coordinates.

x:	0.00	0.25	0.50	0.75	1.00
y:	1.000	0.9896	0.9589	0.9089	0.8415

Estimate the volume of the solid to 3 decimal places.
(OR)
- Form the difference table for

x:	1.0	1.2	1.4	1.6	1.8	2.0	2.2
y:	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

17. Solve: $3x + y + 2z = 3$, $2x - 3y - z = -3$, $x + 2y + z = 4$.

(OR)

18. Solve by Gauss method: $2x + y + z = 10$, $3x + 2y + 3z = 18$, $x + 4y + 9z = 16$.

19. Given $\frac{dy}{dx} = y - x$ where $y(0) = 2$, find $y(0.1)$, $y(0.2)$ correct to 4 decimal places by RK Second order method.

(OR)

20. Solve $y' = 1 + y^2$, $y(0) = 0$, Compute $y(0.8)$ by Milne's method.

SECTION - C (5 X 9 = 45)

Answer ALL the questions:

21. Using Regula - Falsi method determine the root of $\cos x - xe^x = 0$ (upto 3 decimal places).

(OR)

22. The smallest positive root of $f(x) = x^4 - 3x^2 + x - 10 = 0$ is to be obtained. i) Find the interval of unit length which contains this root, ii) Perform two iterations of the bisection method; iii) Taking the mid point of the last interval as the initial approximation, Perform 3 iterations of the Newton-Raphson method.

23. For the following data, calculate the differences and obtain the Forward and backward difference polynomials. Interpolate $x = 0.25$, $x = 0.35$

x:	0.1	0.2	0.3	0.4	0.5
f(x):	1.40	1.56	1.76	2.00	2.28

(OR)

24. Using Newton's backward difference interpolation, construct the interpolating polynomial that fits the data

x :	0.1	0.3	0.5	0.9	1.1
f(x):	-1.699	-1.073	-0.375	1.429	2.631

Estimate the value of $f(x)$ at $x = 0.6$, $x = 1.0$

25. Evaluate the integral $I = \int_0^1 \frac{dx}{1+x}$ using i) Trapezoidal Rule; ii) Simpson's Rule with 8 equal subintervals.

(OR)

26. From the following values of x and y , find $\frac{dy}{dx}$ when $x = 6$;

x:	4.5	5.0	5.5	6.0	6.5	7.0	7.5
y:	9.69	12.90	16.71	21.18	26.37	32.34	39.15

27. Use Gauss method to Compute the inverse of $A = \begin{pmatrix} 2 & 1 & 1 \\ 3 & 2 & 3 \\ 1 & 4 & 9 \end{pmatrix}$.

(OR)

28. Find the solution to 3 decimal places of the system $83x + 11y - 4z = 95$, $7x + 52y + 13z = 104$, $3x + 8y + 29z = 7$ using Jacobi method.

29. Use Picard's method to obtain y for $x = 0.25, 0.5, 1.0$ correct to 3 decimal places for

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

(OR)

30. Determine the values of y when $x = 0.1$ given that $y(0) = 1$ and $y' = x^2 + y$ by modified Euler's Method.