KUMARAGURU
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Register Number: …….

B.E./ B.TECH DEGREE EXAMINATIONS: MAY 2015

(Regulation 2013)

Fourth Semester

U13MAT401: NUMERICAL METHODS

(Common to CE/MECH/FT&TXT)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The order of convergence of Regula-Falsi method is
   a) 1 b) 2
   c) 1.618 d) 4
2. Gauss-elimination is _____ method.
3. Newton's interpolation formula is suitable for
   a) equal intervals b) unequal intervals
   c) odd intervals d) even intervals
4. The n^{th} difference of a polynomial of n^{th} degree are _____
5. For Newton-Cotes formula, for deriving Trapezoidal rule, value of n is
   a) 1 b) 2
   c) 3 d) 4
6. The error in Simpson's (1/3) rule is of order_____
7. The following is a single-step method
   a) Milne's b) Adam's
   c) Gauss d) Taylor's
8. The order of convergence of Euler's method is_____
9. The solution obtained by finite difference method is an
   a) Exact b) correct
   c) Approximate d) two
10. Crank-Nicholson method is _____ scheme.

PART B (10 x 2 = 20 Marks)

(Not more than 40 words)

11. Write the criterion for convergence of Newton–Raphson method.
12. Write the condition for the convergence of Gauss-Seidel method.
13. Write the Lagrange's interpolation formula.
14. Write the normal equations in fitting the parabola $y = ax^2 + bx + c$
15. Write the truncation error in the Trapezoidal rule.
16. Using Newton's forward formula for $\left(\frac{dy}{dx}\right)_{x=x_0}$
17. What is the order of the error in fourth order Runge-Kutta method?
18. Write the Milne's corrector formula.
19. Write the standard five-point formula.
20. Write the finite difference explicit scheme to solve the wave equation.

PART C (5 x 14 = 70 Marks)

(Not more than 400 words)

Q.No. 21 is Compulsory

21. Using Crank-Nicholson method, solve $16u_t = u_{xx}$, $0 < x < 1, t > 0$,subject to u(x,0)=0, u(0,t)=0 and u(1,t) = 100t .Compute u for one time step in t direction, take h=1/4.

22. (a) (i) Find a real positive root of $x \log_{10} x = 1.2$ by Regula-Falsi method.

(ii) Using Gauss-elimination method solve:

3x+4y+5z=18, 2x-y+8z=13, 5x-2y+7z=20

(OR)

(b) (i) Using Newton's Method, find a real positive root of $3x = \cos x + 1$.

(ii) Using Gauss-Seidel method, solve : x+y+54z = 110, 27x+6y-z = 85, 6x+15y+2z =72

23. (a) (i) Fit the straight line trend to the following data

X	0	1	2	3	4
Y	1	1.8	3.3	4.5	6.3

Using method of least squares.

(ii) Using Newton's divided difference formula ,find f(2) & f(8) from :

x:	4	5	7	10	11	13
$f(x)$:	48	100	294	900	1210	2028

(OR)

(b) (i) Fit a Lagrangian polynomial to the following data, hence find y(1).

x:	-1	0	2	3
y:	-8	3	1	12

(ii) Given :

x:	1.0	1.1	1.2	1.3	1.4	1.5
$f(x)$:	0.841	0.891	0.932	0.964	0.985	1.015

find f(1.05).

24. (a) (i) Find the first and second derivative at x=50 from :

x:	50	51	52	53	54	55	56
$f(x)$:	3.6840	3.7084	3.7325	3.7563	3.7798	3.8030	3.8259

(ii) Using Simpson's (1/3) rule evaluate $\int_0^{\pi} \sin x dx$, choosing 11 ordinates.

(OR)

(b) (i) Find the first derivative at x=1971 from

Year:	1931	1941	1951	1961	1971
population:	40.62	60.80	79.95	103.56	132.65

(ii) Evaluate $\int_1^{1.4}\int_2^{2.4} \frac{dxdy}{xy}$,using Simpson's rule.

25. (a) (i) Given $y' = 1 - 2xy, y(0) = 0$, find $y(0.2), y(0.4)$ by Taylor series method.

(ii) Given $y' = y + e^x,\ y(0) = 0,$ find $y(0.2), y(0.4)$ by improved Euler's method.

(OR)

(b) Given $y' = \frac{1}{2}(1+x)y^2, y(0) = 1,$ find y(0.2) by Taylor's method, y(0.4) by Euler's method , y(0.6) by fourth order Runge-Kutta method and y (0.8) by Milne's method.

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