15U603

(Pages: 3) Name: ……………..……….

Reg. No……………..………

SIXTH SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2018

(CUCBCSS-UG)

CC15U MAT6 B11 - NUMERICAL METHODS

Mathematics - Core Course

(2015 Admission)

Time: Three Hours Maximum: 120 Marks

Section A

Answer ***all*** questions. Each question carries 1 mark.

1. Using Bisection Method find first two iterations for the root of the equation $x^3 + 2x - 1 = 0$
2. Write $\Delta^n y_0$ in terms of values of y.
3. Write the relation between E and D.
4. Prove that $\Delta \equiv E - 1$.
5. Write the Gauss's backward difference formula.
6. What do you mean by inverse interpolation?
7. State Simpson's $3/8$ rule of integration.
8. What do you mean by pivoting?
9. Give the sufficient condition for obtaining a solution of a linear system by Jacobi's iteration method.
10. Define the characteristic equation of a square matrix.
11. Give the general form of a 4×4 tri diagonal matrix.
12. Give the Taylor series generated by f at $x = a$.

(12 x 1=12 Marks)

Section B

Answer any ***ten*** questions. Each question carries 4 marks.

13. Explain Regula Falsi method.
14. Using Ramanujan's method, find a real root of the equation
$1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - \cdots = 0.$
15. Construct the backward difference table, where $f(x) = sinx,\ x = 1.0\ (0.1)1.5,\ 4D.$
16. Using the method of separation of symbols, show that
$$\Delta^n u_{x-n} = u_x - nu_{x-1} + \frac{n(n-1)}{2} u_{x-2} + \cdots + (-1)^n u_{x-n}\,.$$

 Turn Over

17. Find the missing term in the following table:

X	0	1	2	3	4
Y	1	3	9	……….	81

18. Find the divided difference table for the data

X	0	1	2	4
f(x)	1	1	2	5

19. Compare Gaussian Elimination and Gauss Jordan Elimination methods.
20. Use Trapezoidal Rule with $n = 2$ to estimate $\int_1^2 \frac{1}{x} dx$.
21. Compute $f'(0.2)$ from the following data.

X	0.0	0.2	0.4	0.6	0.8	1.0
f(x)	1.00	1.16	3.56	13.96	41.96	101.00

22. Define eigen vector of a square matrix.
23. Define the spectral radius of a square matrix.
24. Find the eigen values of the matrix $\begin{bmatrix} -1 & 0 \\ 5 & -3 \end{bmatrix}$.
25. Find the value of $y(0.1)$ using Picard's method: $y' = \frac{x-y}{x+y}$; $y(0) = 1$.
26. Given $y' = \frac{x^2}{y^2+1}$; $y(0) = 0$. Find $y(0.1)$ using second order Runge- Kutta method.

(10x4=40 Marks)

Section C

Answer any ***six*** questions. Each question carries 7 marks.

27. Find a real root of the equation $xe^x = 1$, using the Newton-Raphson method.
28. Use Lagrange's interpolation to find $ln 9.2$ with $n = 3$ with the given table:

X	9.0	9.5	10.0	11.0
ln x	2.1972	2.2513	2.3026	2.3979

29. Prove that the nth differences of an n^{th} degree polynomial is constant.
30. Tabulate $y = x^3$ for $x = 2,3,4,5$ and find the cube root of 10, using method of successive approximations
31. Find the LU decomposition of the matrix $B = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \\ 3 & 1 & 2 \end{bmatrix}$

32. From the following data obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for $x = 1.2$

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

33. Using Simpson's rule evaluate $I = \int_0^1 \frac{1}{1+x} dx$ correct to three decimal places. Take $h = 0.5$
34. Form the Taylor's series for $y(x)$. Find $y(0.1)$ correct to four decimal places if $y(x)$ satisfies $y' = x - y^2$ and $y(0) = 1$.
35. Given $y' = x + y$; $y(0) = 1$. Find approximately the value of y at $x = 0.2$ and $x = 1$, using Picard's method.

(6x7=42 Marks)

Section D

Answer any ***two*** questions. Each question carries 13 marks.

36. (a) Derive Newton's forward difference interpolation formula.
    (b) The table gives the value of $\tan x$ for $0.10 \le x \le 0.30$. Find $\tan 0.12$

X	0.10	0.15	0.20	0.25	0.30
Y	0.1003	0.1511	0.2027	0.2553	0.3093

37. Solve the following system using Gauss-Jordan method:
    $2x - 3y + z = -1, x + 4y + 5z = 25, 3x - 4y + z = 2$
38. (a) Use fourth order Runge- Kutta method with $h = 0.2$ to find the value of y at $x = 0.2, x = 0.4$ and $x = 0.6$, given $\frac{dy}{dx} = 1 + y^2; y(0) = 0$
    (b) Given $\frac{dy}{dx} = 1 + y^2; y(0) = 0$. Compute $y(0.8)$ using Milne's method.

(2x13=26 Marks)

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