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Name ....

Reg. No···················

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2016

(CUCBCSS UG)

Complementary Course

MAT 4C 04—MATHEMATICS

Maximum : 80 Marks

Time : Three Hours

Part A

Objective type.
Answer all **twelve** *questions.*

1. What do you mean by a non linear differential equation ?

2. Write the solution for an homogeneous differential equation with $2 \pm 3i$ as a double root for its auxiliary equation.

3. State the Existence and Uniqueness theorem for initial value problem.

4. What is the Shifting property of Laplace transform ?

5. Find L $\left(\dfrac{1}{(s+1)^2} \right)$.

6. What is L $\left(t^{\cdots} \right)$?

7. How do you define a **sawtooth** wave function ?

8. Define and give an example of an odd function.

9. Write the **Euler's** formula for a **fourier** series of a periodic function.

10. Write the formula for Runge **Kutta** method.

11. Does the **inital** value problem $xy' = 4y,\ y(0) = 1$ has solution ? Give reason.

12. Give a formula for an error for Simpson's rule.

(12 x 1 = 12 marks)

Part B

Short answer type.
Answer any **nine** *questions.*

13. Find the particular integral for $y' + 4y = 8x^2$.

14. Find a basis for the solution of the differential equation $y - y = 0$.

15. Find W $\big[$

Turn over

16. If $L^{-1}(f(s)) = F(t)$ then show that $L'(f(s-a)) = \quad F(t)$.

17. Show that the Laplace transform is a linear operation.

18. Find L $(\sin t)$.

19. Show that the function $f(x) = $ constant is a periodic function of period p for every positive p.

20. Find the fourier series of $f(x) = \dfrac{}{,-}<$

21. Show that u $= \cos 4t \sin 2x$ is a solution of the wave equation.

22. Apply Picard's iteration upto 4 steps to solve y' =y and y(0)= 1.

23. Show that the initial value problem $y'\underline{\quad\quad\quad} y(0) = 0$ does not have a unique solution.

24. What do you mean by Lipschitz condition ?

(9 x 2 = 18 marks)

Part C

Short essay.
Answer any **six** *questions.*

25. Solve $x\, y'' + 7xy' + 13y = 0$.

26. Verify $y_p = 2x^2 - 6x + 7$ is a solution for $y +3y' +2y = 4x^2$ and find a general solution.

27. Find the Laplace transform of $f(t) = \begin{array}{l} 0 \quad -t \\ 5, t > 4 \end{array}$

28. Find $\left(\dfrac{3s+16}{s^2 - s - 6} \right)$.

29. Solve u $= 2xyu$.

30. Find the cosine series off $(x) = x, \mathbf{0 < x < L.}$

31. Solve the integral equation $y(t) = t + \quad y(\tau) \sin (t - \quad d\tau.$

32. *Using* Simpson's rule evaluate the integral $\int_{1} x\, dx$ with n = **4 and hence find an upper bound for** the error incurred.

33. Apply improved Euler method in 3 steps to solve $y' = $ y, y(0) = 1 with $h = $ **0.1. Also find the error occurred.**

(6 x 5 = 30 marks)

Part D

Answer any two questions.

34. **(a) Solve** $x\,y'' - 4xy' + 6y = 21x$.

    (b) Solve the initial value problem $(D^2 + 4)\,y = -12 \sin 2x$, $y(0) = 1.8$, $y'(0) = 5$.

35.   **Solve the integral equation** $y(t) = t + \int_0^t y(\tau)\sin(t-t)\,ch.$

36.   **Find the fourier series of** $f(x) = \begin{vmatrix} & -\dfrac{\pi}{2} < x < \dfrac{it}{2} \\[2mm] \pi^- & \dfrac{\pi}{2} < x < \dfrac{3\pi}{2} \\ 4 & 2 \end{vmatrix}$

(2 x 10 = 20 marks)