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(Pages : 3)

Name.................................

Reg. No..................................

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL/MAY 2015

(U.G.–CCSS)

Complementary Course—Mathematics

MM 4C 04—MATHEMATICS

Time : Three Hours

Maximum : 30 Weightage

Unit I

*Answer all **twelve** questions.*

1. Which of the following is not a solution of $y'' - y = 0$?

    (a) e^x.

    (b) e^{-x}.

    (c) $e^x + e^{-x}$.

    (d) $1 + e^x$.

2. Find the general solution of $y'' + 9y' + 20y = 0$.

3. Write a pair of basis solutions of $x^2 y'' - 4xy' + 6y = 0$.

4. If $y_1 = e^{2x}$, $y_2 = e^{-x}$ find $w(y_1, y_2)$.

5. Find the Laplace transform of sin wt.

6. Find $L^{-1} \left(\dfrac{60 + 6s^2 + s^4}{s^7} \right)$.

7. $f(x) = x^3 + 2x^2$ is an :

    (a) Even Function.

    (b) Odd function.

    (c) Neither even nor odd.

    (d) Either even or odd.

8. Write the one dimensional wave equation.

9. Find the smallest period p of cos πx.

10. Plot the function $f(x) = x|x|$, $-\pi < x < \pi$.

11. Find a solution of the partial different equation $u_{xx} - u = 0$.

12. Write the iteration formula for the Picards methods.

(12 × ¼ = 3 weightage)

Turn over

Unit II

Answer any **nine** *questions.*

13. Apply $(D + 5)^2$ to $\sin 5x + 5x$.

14. Find the general solution of $y'' + 10y' + 25 = 0$.

15. Find two linearly independent solutions of $x^2 y'' - 2.5x y' - 2 = 0$.

16. Find a particular solution of $y'' - 5y' + 6y = e^x$.

17. Reduce to first order and solve $2xy'' = 3y'$.

18. Find the Laplace transform of $(t + 1)^2 e^t$.

19. If $L[f(x)] = F(s)$ prove that

$$L\left(\frac{f(x)}{x}\right) = \int_s^\infty F(p)\, dp.$$

20. Find $L^{-1}\left[\dfrac{1}{s(1 + 2s)}\right]$.

21. Show that $u = x^2 + y^2$, $f = 4$ satisfies the Poissons equation.

22. Find the solutions of $u_{xx} + u_{yy} = 0$ by separating the variables.

23. Find a_0 in the Fourier series expansion of $f(x) = \begin{cases} o & \text{if} \quad -2 < x < -1 \\ k & \text{if} \quad -1 < x < 1. \\ o & \text{if} \quad 1 < x < 2 \end{cases}$

24. Find first two approximate solutions $y_1(x)$ and $y_2(x)$ of the initial value problem $y' = x +$
    $y(0) = -1$ using Picard's method.

(9 × 1 = 9 weighta

Unit III

Answer any **five** *questions.*

25. Solve the initial value problem $y'' + 1.5y' - y = 12 x^2 - 6x^3 - x^4$, $y(0) = 4, y'(0) = 8$.

26. Using method of variation of parameters solve $y'' + y = \sec x$.

27. Find $t * e^t$ where $*$ denotes convolution.

28. Using method of partial fractions find $L^{-1}\left[\dfrac{s^2 + 9s - 9}{s^3 - 9s}\right]$.

29. Using convolution find the inverse Laplace transform of $\dfrac{1}{s\left(s^2+4\right)}$.

30. Solve the integral equation $y(t)=t+\int_0^t y(\tau)\sin(t-\tau)\,d\tau$.

31. Find the Fourier series expansion of $f(x)=x^2,\ -\pi<x<\pi$.

32. Using Simpson's rule with $n=4$ estimate $\int_0^1 5\,x^4\,dx$.

$(5 \times 2 = 10$ weightage$)$

Unit IV

*Answer any **two** questions.*

33. Solve $x^2\,y''-4xy'+6y=21\,x^{-4}$.

34. Using Runge-Kutta method solve the initial value problem
$y'=x+y,\ y(0)=0,\ h=0\cdot2$.

35. Find the Fourier series of $f(x)=\begin{cases}\dfrac{1}{2}(\pi+x), & -\pi\le x<0 \\[2mm] \dfrac{1}{2}(\pi-x), & 0\le x<\pi\end{cases}$

$(2 \times 4 = 8$ weightage$)$