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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 Weight:

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 $\cos \pi x$.

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 weigh

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 $L[f(z)] = F(s)$ prove that

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

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

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 $f(x) = \begin{cases} o & \text{if} & -2 < x < -1 \\ k & \text{if} & -1 < x < 1. \\ o & \text{if} & 1 < x < 2 \end{cases}$

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

$(9 \times 1 = 9$ weightage$)$

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 $L^{-1}\left[\frac{s^2 + 9s - 9}{s^3 - 9s}\right]$.

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 $\int_0^1 5x^4\,dx$.

(5 × 2 = 10 weightage)

Unit IV

Answer any two questions.

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

34. Using Runge-Kutta method solve the initial value problem

$y' = x+y,\ y(0)=0,\ h=0.2$.

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

(2 × 4 = 8 weightage)