MODEL QUESTION PAPER

FOURTH SEMESTER B.Sc DEGREE PROGRAMME
MATHEMATICS-COMPLEMENTARY COURSE

MM4C04: MATHEMATICS

Time: 3 Hours Maximum:30 weightage

I Answer all questions (12 x ¼= 3 weightage)

1. The general solution of $y'' + 5y' + 6y = 0$ is ………………………..
2. The auxiliary equation corresponding to the Euler equation $x^2 y'' + axy' + by' = 0$

   is …………..
3. The wronskian of the functions $y_1 = e^{-ax}$ and $y_2 = e^{bx}$ is …………….
4. If L denotes the Laplace transformation then L(f(t)) =………………………..
5. L(cos at) =…………………
6. $L(f''(t))$ =………………
7. $L^{-1}(\frac{1}{s^n})$ =…………………
8. The fundemental period of sinx is …………………..
9. An example of a function which is neither even nor odd is …………..
10. The one dimensional heat equation is given by ……………………
11. The iterative nth step of Euler method is ……………..
12. By Trapezoidal rule the approximate value of $\int_a^b f(x)\,dx$ is ………………

II. Short answer type questions (Answer all questions- 9 x1=9 weightage)

13. Solve the initial value problem $y'' + 6y' + 9y = 0 \quad y(0) = \rightarrow 4$, $y'(0) = 14$

14. Solve $y'' \rightarrow 4y' + 3y = 10e^{2x}$

15. Find L(t cosat)

16. Find the Laplace transform of $\frac{\sin at}{t}$

17. Find the inverse Laplace transform of $\frac{s+1}{s(s+2)(s+3)}$

18. Solve the partial differential equation $u_y + 2yu = 0$, where u is a function of two variables x and y

19. Verify that $u = x^3 \rightarrow 3xy^2$ is a solution of Laplace's Equation.

20. Apply Euler's method to find y (1) , given $y' = x + y$ y(0) =0 , choosing h=0.2

21. Use the Trapezoidal rule with n=4 to estimate $\int_0^2 \frac{1}{1+x} dx$

III. Short essay or paragraph questions (Answer any 5 questions from 7)

(5x2=10Weightage)

22. Using the method of reduction of order solve the differential equation $x^2 y'' - 5x y' + 9y = 0$, given that $y = x^3$ is a solution.

23. Solve $(D^2 \rightarrow 2D + 1) y = e^x + x$

24. Solve $(D^2 \rightarrow 4D + 3) y = \sin 3x \cos 2x$

25. Using Convolution theorem find the inverse Laplace transform of $\frac{1}{(s^2 + a^2)^2}$

26. Using Laplace transform solve the following integral equation

$$y(t) = t + \int_0^t y(u) \sin(t \rightarrow u) du$$

27. Find the two half range expansions of the function

$$f(x) = \pi \rightarrow x \qquad 0 < x < \pi$$

28. Using Picard's method Find approximate solution to the initial value problem $y' = x + y$ y(0)=1. Find approximately the value of y for $x = 0.1$ and $x = 0.2$. Check the result with the exact value.

IV. Essay Questions (Answer any 2 question from 3) (2x4=8 weightage)

29. (a). Using method of variation of parameters solve

$$(x^2 D^2 \rightarrow 2xD+2)y=x^3 \cos x$$

(b). Using Laplace transform solve $y'' + 2y' \rightarrow 3y = \sin t$, $y(0)=0$,

$y'(0)=0$

30. . Find the Fourier series to represent $f(x)$ defined by

$$f(x)= \begin{matrix} \pi+x \; ; \rightarrow\pi<x<0 \\ \pi\rightarrow x \; ; 0<x<\pi \end{matrix}$$

And deduce that

$$\frac{\pi^2}{8} = \frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots\ldots\ldots\ldots\ldots\ldots$$

31. (a). Find the solution of the partial differential equations (1) $u_y=2xyu$

(2) $u_{xy}=-u_x$

(b). Use Runge –Kutta method to solve $\frac{dy}{dx}=xy$ at $x=1.4$, given $y(1)=2$

and taking. $h=0.2$

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