

C 15454

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Name.....

Reg. No.....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2011

(CCSS)

Complementary Course

Mathematics

MM 4C 04—MATHEMATICS

Time : Three Hours

Maximum : 30 Weightage

I. Answer all twelve questions :

- 1 Find the Laplace transform of $f(t) = \cos wt$.
 - 2 Find the Laplace transform of $\alpha + bt + ct^2$.
 - 3 Find $L^{-1} \left[\frac{e^{-3s}}{s^3} \right]$.
 - 4 Reduce to the first order and solve $yy' = 2y^2$.
 - 5 Apply the operator $(D^2 + 3D)$ to $\cosh 3x$.
 - 6 Solve $x^2 y'' = 3xy' + 4y = 0$.
 - 7 Verify that $y_p = 2x^2 - 6x + 7$ is a solution of $y'' + 3y' + 2y = 4x^2$.
 - 8 Find $L[f(t)]$ where $f(t) = t$.
 - 9 Examine whether $f(x) = x|x|$ is odd, even or neither odd nor even.
 - 10 Find a solution of the equation $u_{xy} = -u_x$.
 - 11 Find $L(e^{ax})$.
 - 12 Examine whether $f(x) = x^4$ ($0 < x < 2\pi$) is odd, even or neither odd nor even.
- (12 × ¼ = 3 weightage)

Turn over

II. Short Answer type questions. Answer *all* nine questions :

13 Solve $y'' + 4y = 8x^2$.

14 Find $L(\sin wt)$.

15 Find $L(2t + 6)$.

16 Find the Laplace transform of $\sin^2 t$.

17 Find $L^{-1}\left[\frac{e^{-3s}}{(s-1)^3}\right]$.

18 Reduce to first order and solve $y'' = y'$.

19 Apply the operator $(D^2 + 3D)$ to $e^{-x} + e^{2x}$.

20 Verify that $y_p = e^{-3x}$ is a solution of $y'' - y = 8e^{-3x}$.

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

(9 × 1 = 9 weightage)

III. Answer any *five* questions :

22 Solve the initial value problem $y'' + 4y' + 4y = 0$, $y(0) = 1$, $y'(0) = 1$.

23 Using the method of variation of parameters solve $y'' + 2y' + y = e^{-x} \cos x$.

24 Find the inverse Laplace transform of $\frac{-s - 10}{s^2 - s - 2}$.

25 Using convolution find the inverse $h(t)$ of $H(s) = \frac{1}{s^2(s-1)}$.

26 Apply Euler's method to solve $y' = x + y$, $y(0) = 0$, $h = 0.2$.

27 Use the trapezoidal rule with $n = 4$ to estimate $\int_1^3 (2x - 1) dx$.

28 Find the inverse transform of $\ln\left(1 + \frac{w^2}{s^2}\right)$.

(5 × 2 = 10 weightage)

IV. Answer any *two* questions :

29 Using Laplace transform solve $y'' + y' - 6y = 1$, $y(0) = 0$, $y'(0) = 1$.

30 Find the Fourier series of :

$$f(x) = \begin{cases} 1 & \text{if } -\pi < x < 0 \\ -1 & \text{if } 0 < x < \pi \end{cases}$$

31 Apply Euler's method to solve $y' = \frac{1}{2} \pi \sqrt{1 - y^2}$, $y(0) = 0$, $h = 0.1$.

(2 × 4 = 8 weightage)