

D 11548

(Pages : 3)

Name.....

Reg. No.....

**FIFTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT)
EXAMINATION, NOVEMBER 2016**

(UG-CCSS)

Mathematics

MM 5B 08—DIFFERENTIAL EQUATIONS

Time : Three Hours

Maximum : 30 Weightage

Section A

Each question carries a weightage of 1/4.

1. What is the order of $y'' + y^5 + 5y = \tan t$
2. Is $y' = y^3 \cos x$ separable ?
3. Check for exactness $(2xy + 2y) dx + (2x^2 y + 2x) dy = 0$
4. Solve $y'' - 4y = 0$.
5. State Abel's theorem.
6. Find the Wronskian of $y_1 = e^x, y_2 = e^{-x}$
7. Find $L^{-1} \{ \frac{1}{s^2 + 4} \}$
8. State True or False :
The Laplace transform is a linear operator.
9. Find $L \{ \sin 5t \}$.
10. What is the fundamental period of $\sin 5x$?
11. What is the one-dimensional wave equation ?
12. Is the following function even, odd or neither $\sec x$.

(12 x 1/4 = 3 weightage)

Turn over

Section B

Each question carries a weightage of 1.

13. Verify that $y = \frac{t}{3}$ is a solution of $y''' + 4y' + 3y = t$
14. State the existence and uniqueness theorem for First order initial value problem.
15. Verify whether ' y ' is an integrating factor of $\frac{1}{Y} + \frac{2x}{Y^2} dy = 0$.
16. Solve $y'' - 5y' + 6y = e^{2x}$.
17. Solve $y' - 16y = 0$.
18. Find $L\{\cosh at\}$.
19. Show that convolution is commutative.
20. Show that the sum of an even and odd function is odd.
21. Graph the full function $f(x) = 0, -3 < x < -1, f(x+6) = f(x)$
 $1, -1 < x < 1$
 $0, 1 < x < 3$

(9 x 1 = 9 weightage)

Section C

Each question carries a weightage of 2.

22. Find an integrating factor and solve : $dx + (x - \sin y) dy = 0$
23. Solve the initial value problem : $(x+4)(y^2+1)dx + y(x^2+3x+2)dy = 0, y(0) = 1$.
24. Solve the initial value problem : $y'' + 2y' + 5y = 4 \cos 2t, y(0) = 1, y'(0) = 0$.
25. Solve $y'' - y = \cosh t + \cos t$
26. Find $\lim_{s \rightarrow 3} \left\{ \frac{2s-3}{s^2-4} \right\}$.

27. Find $L\{t \cos at\}$.

28. Find the Fourier cosine series of $f(x) = L - x, 0 \leq x \leq L$, f being of period $2L$.

(5 x 2 = 10 weightage)

Section D

Each question carries a weightage of 4.

29. Solve by the method of variation of parameters :

$$4y'' + y = 2 \sec\left(\frac{t}{2}\right), -\pi < t < \pi.$$

30. (i) Using convolution, find $L^{-1}\left\{\frac{1}{(s+1)^2}\right\}$

(ii) Use Laplace transforms to solve $y'' + 3y' + 2y = 0, y(0) = 1, y'(0) = 0$

31. Find the Fourier series expansion of :

$$f(x) = \begin{cases} 0, & -L < x < 0 \\ L, & 0 < x < L \end{cases}, f \text{ of period } 2L.$$

Hence deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$

(2 x 4 = 8 weightage)