

C 5162

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Name...

Reg. No

**FOURTH SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT)  
EXAMINATION, MAY 2016**

(UG—CCSS)

Complementary Course

MM 4C 04—MATHEMATICS

Time : Three Hours

Maximum : 30 Weightage

**Section A**

*Answer all questions.  
Each question carries a weightage of  $1\frac{1}{4}$ .*

1. Is the equation  $y = \sqrt{y} + 1$  linear or non-linear ?
2. Is  $y = e^x$  a solution of  $y'' + y = 0$  ?
3. Solve  $y'' + 7y = 0$ .
4. Find the Laplace Transform of  $f(t) =$
5. Define the unit impulse function.
6. Find the inverse Laplace Transform of  $F(s) = \frac{2s-3}{s^2}$ .
7. Find the fundamental period of  $\cos 2\pi x$ .
8. Is the following function even or odd or neither  $x^2 \cos nx$ .
9. What is the 2 dimensional Laplace equation ?
10. Define the Lipschitz condition.
11. What is an initial value problem ?
12. State Simpson's rule.

(12 x  $1\frac{1}{4}$  = 3 weightage)

**Section B**

*Answer all questions.  
Each question carries a weightage of 1.*

13. Find the Wronskian of the functions  $y_1 = x^2$  and  $y_2 = x^2 \ln x$ .
14. Find the solution of  $y'' + 4y' + 4y = 0$ .
15. Find the Laplace Transform of  $f(t) = \cosh 7t$ .

Turn over

16. Find the inverse Laplace Transform of  $F(s) = (s-2)^{-1}$ .
17. Is  $u = \sin ct \sin x$  a solution of the wave equation (with suitable  $c$ )?
18. Solve  $u_x = u_x$
19. Solve  $u = U$ .
20. Show that  $f(x, y) = |\sin y| + x$  satisfies the Lipschitz condition with  $m = 1$ .
21. Apply Euler's method and compute  $y_1, y_2, \dots, y_5$  with  $h = 0.02$ , given  $y' = (y - x), y(0) = 1$ .

(9 x 1 = 9 weightage)

**Section C**

Answer any **five** questions.  
Each question carries a weightage of 2.

22. Solve  $y'' + y = 2 + 2x + x^2, y(0) = 8, y'(0) = -1$ .
23. Solve  $x^2 y'' + xy' + y = 0$ .
24. Find the Laplace Transform of  $F(t) = t e^{-2t} \sin 2t$ .
25. State the convolution theorem and use it to evaluate the inverse  $h(t)$  of  $H(s) = s(s^2 + a^2)^{-1}$ .
26. Find the Fourier sine series of  $f(x) = 7 - x, 0 < x < 7\pi$ .
27. Using Runge Kutta Method, find  $y$  when  $x = 0.2$ , given  $y' = \frac{y^2 - x^2}{y^2 + x^2}, y(0) = 1$ .
28. Evaluate  $\int_0^1 (x^2 + x) dx$  using Trapezoidal rule, taking  $h = 0.25$ .

(5 x 2 = 10 weightage)

**Section D**

Answer any **two** questions.  
Each question carries a weightage of 4.

29. Solve  $y'' + y = \sec x$ .
30. Solve by the method of Laplace Transforms :  $y'' + y = t, y(0) = 1, y'(0) = -2$ .
31. Find the Fourier series expansion of  $f(x) = \frac{x^2}{2} - \pi < x < \pi$ . Hence show that

$$\frac{1}{4} - \frac{1}{9} + \frac{1}{16} - \frac{1}{25} + \dots = \frac{\pi^2}{6}$$

(2 x 4 = 8 weightage)