



K17U 1697

Reg. No. :

Name :

V Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination,
November 2017

(2014 Admn. Onwards)

CORE COURSE IN MATHEMATICS

5B07 MAT : Differential Equations, Laplace Transform and Fourier
Series

Time : 3 Hours

Max. Marks : 48

SECTION – A

Answer all the questions. Each question carries one mark.

1. Solve : $y' = -\sin \pi x$.
2. When do you say a first order ODE is linear ?
3. Find the Wronskian of y_1 and y_2 where $y_1(x) = \cos \omega x$ and $y_2(x) = \sin \omega x$.
4. Solve : $y'' + \omega^2 y = 0$. (4×1=4)

SECTION – B

Answer any 8 questions. Each question carries two marks.

5. Test for exactness and solve, $e^x(\cos y dx - \sin y dy) = 0$.
6. Find the orthogonal trajectory of $x^2 - y^2 = c$.
7. Solve the initial value problem $y'' + 2y' + y = 0$, $y(0) = 4$, $y'(0) = -6$.
8. Find the general solution to $x^2 y'' + 1.5xy' - 0.5y = 0$.
9. Solve : $y'' + 2y' + 5y = 0$.
10. Find an ODE for which the functions, $e^{-2x} \cos \omega x$ and $e^{-2x} \sin \omega x$ are solutions.
11. Find the Laplace transform of $\sin t \cos t$.

P.T.O.



12. Find the Inverse Laplace Transform of $\frac{18s-12}{9s^2-1}$.

13. Find the Fourier series of the function $f(x) = x + \pi$ if $-\pi < x < \pi$ and $f(x+2\pi) = f(x)$.

14. Find the Fourier series of the function $f(x) = \begin{cases} -1 & \text{if } -2 < x < 0 \\ 1 & \text{if } 0 < x < 2 \end{cases}$ (8x2=16)

SECTION - C

Answer **any 4** questions. **Each** question carries **four** marks.

15. Solve the initial value problem, $y' + y \tan x = \sin 2x$, $y(0) = 1$.

16. Solve the nonhomogeneous ODE, $y'' - 4y' + 4y = x^2 e^x$ by variation of parameters.

17. Using the convolution theorem, $y'' + y = \sin t$, $y(0) = 0$, $y'(0) = 0$.

18. Find the inverse transform of $\frac{3s+1}{(s-1)(s^2+1)}$.

19. Find the Fourier series of the function $f(x) = x^2$, $-1 < x < 1$. Deduce that

$$1 - \frac{1}{4} + \frac{1}{9} - \frac{1}{16} + \dots = \frac{\pi^2}{12}$$

20. Find the Fourier integral representation of the function $f(x) = \begin{cases} 1 & \text{if } 0 < x < a \\ 0 & \text{if } x > a \end{cases}$ (4x4=16)

SECTION - D

Answer **any 2** questions. **Each** question carries **six** marks.

21. Find an integrating factor and solve : $(x^4 + y^2) dx - xy dy = 0$, $y(2) = 1$.

22. Find a general solution to $y'' + 9y = \cos x + \frac{1}{3} \cos 3x$.

23. Using Laplace transforms solve, $y'' + 2y' + y = e^{-t}$, $y(0) = 0$, $y'(0) = 1$.

24. Find the a) Fourier cosine series and b) Fourier sine series for the function f defined by $f(x) = 2 - x$, $0 < x < 2$. (2x6=12)