K16U 2111

Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.) Examination, November 2016
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS FOR PHYSICS AND ELECTRONICS
3C03 MAT-PH : Mathematics for Physics and Electronics – III

Time : 3 Hours

Max. Marks : 40

SECTION – A

All the **first 4** questions are **compulsory**. They carry **1** mark **each.**

1. Solve : $y' = x^2\sqrt{y}, \quad y(0) = 1.$

2. Give the general solution of the differential equation, $y'' - y = 0.$

3. Give the Laplace transform of sinh at.

4. Write the one-dimensional heat equation.

(4×1=4)

SECTION – B

Answer **any 7** questions from among the questions **5** to **13**. These questions carry **2** marks **each**.

5. Solve, (cos y sinh x + 1) dx – sin y cosh x dy = 0.

6. Solve the initial value problem, $y' = e^{x^2} + 2xy, \quad y(0) = 0.$

7. Find the orthogonal trajectories of the family of straight lines, y = cx.

P.T.O.

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each**.

20. A thermometer, reading 10°C is brought into a room whose temperature is 23°C. Two minutes later the thermometer reading is 18°C. How long will it take until the reading is 22.8°C ?

21. Solve $y'' + y = \sec x$ by variation of parameters.

22. Applying Laplace transform, solve the following system.

$$y'_1 = -\frac{8}{100}y_1 + \frac{2}{100}y_2 + 6 \qquad y_1(0) = 0,$$

$$y'_2 = \frac{8}{100}y_1 - \frac{8}{100}y_2 \qquad y_2(0) = 150$$

23. Find the two half-range expansions of the function f defined by

$$f(x) = \begin{cases} \dfrac{2k}{L}x & \text{if } 0 < x < \dfrac{L}{2} \\[3mm] \dfrac{2k}{L}(L-x) & \text{if } \dfrac{L}{2} < x < L \end{cases}$$

(2×5=10)

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8. Solve the initial value problem, $y'' + \pi y' = 0$, $y(0) = 3$, $y'(0) = -\pi$.

9. Find the inverse transform of $\dfrac{3s - 137}{s^2 + 2s + 401}$.

10. Solve the initial value problem, $y'' - \dfrac{1}{4}y = 0$, $y(0) = 4$, $y'(0) = 0$, using Laplace transforms.

11. Solve for $u = u(x, y)$: $u_{yy} + 16u = 0$.

12. Show that $u = \cos x \sin y$ satisfies the Poisson equation with $f = -2\cos x \sin y$.

13. Find the Fourier series of the function $f(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ k & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases}$ (7×2=14)

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3** marks **each**.

14. Find the integrating factor and solve : $(x^2 - 2x + 2y^2)\,dx + 2xy\,dy = 0$.

15. Solve : $y'' + 25y = 2\sin 5x$.

16. Solve : $x^2 y'' - 4xy' + 6y = 0$, $y(1) = 1$, $y'(1) = 0$.

17. Using Laplace transforms solve, $y(t) - \int_0^t y(\tau)\sin(t-\tau)\,d\tau = t$.

18. Find the Fourier series of the function

$f(x) = \begin{cases} 0 & \text{if } -L < t < 0 \\ E\sin\omega t & \text{if } 0 < t < L \end{cases}$

19. Find the type, transform to normal form and solve : $u_{xx} + 9u_{yy} = 0$.   (4×3=12)

SECTION – D

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21. Solve $y'' + y = \sec x$ by variation of parameters.

22. Applying Laplace transform, solve the following system.

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$$y_2' = \frac{8}{100}y_1 - \frac{8}{100}y_2 \qquad y_2(0) = 150$$

23. Find the two half-range expansions of the function f defined by

$$f(x) = \begin{cases} \dfrac{2k}{L}x & \text{if } 0 < x < \dfrac{L}{2} \\[3mm] \dfrac{2k}{L}(L-x) & \text{if } \dfrac{L}{2} < x < L \end{cases}$$

(2×5=10)

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