

SECTION - B

Answer any 2 questions from among the questions 20 to 23. These questions carry 2 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°C ?

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

22. Applying Laplace transform, solve the following system.

$$x' = (0) x + \frac{1}{100} y + 0, \quad y' = \frac{1}{100} x + 0$$

$$x' = \frac{1}{100} y + 0, \quad y' = \frac{1}{100} x + 180$$

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

$$f(x) = \begin{cases} x & 0 < x < \frac{\pi}{2} \\ \frac{\pi}{2} & \frac{\pi}{2} < x < \pi \end{cases}$$



Reg. No. :

Name :

Third Semester B.Sc. Degree (CBCSS – Reg./Supple./Imp.)
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(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 : $y' = x^2\sqrt{y}$, $y(0) = 1$.
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. (4x1=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, $y' = e^{x^2} + 2xy$, $y(0) = 0$.
7. Find the orthogonal trajectories of the family of straight lines, $y = cx$.



8. Solve the initial value problem, $y'' + \pi y' = 0$, $y(0) = 3$, $y'(0) = -\pi$.
9. Find the inverse transform of $\frac{3s-137}{s^2+2s+401}$.
10. Solve the initial value problem, $y'' - \frac{1}{4}y = 0$, $y(0) = 4$, $y'(0) = 0$, 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 $f(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ k & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases}$ (7x2=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: $u_{xx} + 9u_{yy} = 0$. (4x3=12)



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.
- $$y_1' = -\frac{8}{100}y_1 + \frac{2}{100}y_2 + 6 \quad y_1(0) = 0,$$
- $$y_2' = \frac{8}{100}y_1 - \frac{8}{100}y_2 \quad y_2(0) = 150$$
23. Find the two half-range expansions of the function f defined by

$$f(x) = \begin{cases} \frac{2k}{L}x & \text{if } 0 < x < \frac{L}{2} \\ \frac{2k}{L}(L-x) & \text{if } \frac{L}{2} < x < L \end{cases} \quad (2 \times 5 = 10)$$