

K15U 0279

Reg. No.:

Name:

Third Semester B.Sc. Degree (CCSS – 2014 Admn. – Regular) Examination, November 2015

Complementary Course in Mathematics for Physics/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: $y' = -\sin \pi x$.
- 2. When do we say a second-order ODE is linear?
- 3. Give the Laplace transform of cosh at.
- 4. Write the one-dimensional wave equation.

SECTION - B

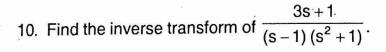
Answer any 7 questions from among the questions 5 to 13. These questions carry 2 marks each.

- 5. Solve: $\cos(x + y) dx + (3y^2 + 2y + \cos(x + y)) dy = 0$.
- 6. Solve the initial value problem, $y' + y \tan x = \sin 2x$; y(0) = 1.
- 7. Find the orthogonal trajectories of the family of parabolas, $y = cx^2$.

8. Solve:
$$x^2y'' + \frac{3}{2}xy' - \frac{1}{2}y = 0$$

9. If H (s) =
$$\frac{1}{s(s-a)}$$
, find h (t).





- 11. Solve for $u = u(x, y) : u_y + u = e^{xy}$.
- 12. Find the Fourier series of the function $f(x) = x + \pi$ if $-\pi < x < \pi$ and $f(x + 2\pi) = f(x)$.
 - 13. Show that u = arc tan (y/x) is a solution to the two-dimensional Laplace equation.

SECTION - C

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

- 14. Find an integrating factor and solve, $(e^{x+y} + ye^y) dx + (xe^y 1) dy = 0$, y(0) = -1.
- 15. Solve the initial value problem, $y'' + 4y = 16 \cos 2x$; y(0) = 0, y'(0) = 0.
- 16. Reduce to first order and solve, $yy'' = 4y'^2$.
- 17. Solve the initial value problem y'' y = t; y(0) = 1, y'(0) = 1, using Laplace transforms.
- ⁷18. Find the Fourier series of the 2π -periodic function f defined by

$$f(x) = \begin{cases} -k & \text{if } -\pi < x < 0 \\ k & \text{if } 0 < x < \pi \end{cases}$$

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

19. Find the type, transform to normal form and solve : $u_{xy} - u_{yy} = 0$.





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

- 20. Suppose that in Winter the daytime temperature in a certain office building is maintained at 70° F. The heating is shut off at 10 pm and turned on again at 6 am. On a certain day the temperature inside the building at 2 am was found to be 65° F. The outside temperature was 50° F at 10 pm and had dropped to 40° F by 6 am. What was the temperature inside the building when the heat was turned on at 6 am?
- 21. Solve, $y'' + y = \tan x$ by variation of parameters.
- 22. Applying Laplace transform, solve the following system.

$$y'_1 = 3y_1 - 3y_2 + 2$$
 $y_1(0) = 1,$
 $y'_2 = -6y_1 - t$ $y_2(0) = -1.$

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

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