K15U 0282

Reg. No. : .....

Name : .....

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

Complementary Course in Mathematics for Computer Science

3C03 MAT-CS : MATHEMATICS FOR COMPUTER SCIENCE – III

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. Find the value of n for which the equation $(ye^{2xy} + x)\,dx + nxe^{2xy}dy = 0$ is exact.
2. Find the Wronskian, $W(x, xe^x)$.
3. Give the Laplace transform of t^{n+1}.
4. Determine the relation between a and b if $u(x, y) = f(ax + by)$ is a solution to $3u_x - 7u_y = 0$ for any differentiable function f such that $f'(z) \neq 0$ for all real z.

(4×1=4)

SECTION – B

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

5. Solve the initial value problem : $y' = 2xy^2 + y^2 + 2x + 1$, $y(0) = 1$.
6. Find the general solution, $y' + 3.5y = 2.8$.
7. Solve : $e^{-2\theta}\,dr - 2re^{-2\theta}\,d\theta = 0$.
8. Find a general solution to $y'' - y' + 2.5y = 0$.
9. Find the Laplace transform of $5e^{-at}\sin wt$.

P.T.O.

10. Find the inverse Laplace transform of $\frac{15}{s^2 + 4s + 29}$.

11. Find the first order PDE, by eliminating the arbitrary function f satisfied by u, $u(x, y) = f(x/y)$.

12. Determine whether $u(x, y) = x^2 + y^2$ is a solution to the PDE, $u_{xx} + u_{yy} = 0$.

13. Solve the equation $u_x = 1$ subject to the initial condition $u(0, y) = y$. **(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 particular member of orthogonal trajectories of $x^2 + cy^2 = 1$ passing through the point (2, 1).

15. Find a basis of solutions of the ODE $(x^2 - x)\,y'' - xy' + y = 0$.

16. Solve the following initial value problem by the method of undetermined coefficients.

$y'' + y = 0.001\,x^2$, $y(0) = 0$, $y'(0) = 1.5$.

17. Solve the initial value problem $y'' - y = t$; $y(0) = 1$, $y'(0) = 1$, using Laplace transforms.

18. Find the type, transform to normal form and solve : $u_{xx} + 9u_{yy} = 0$.

19. Find the Fourier series of $f(x) = (\pi - x)/2$ in the interval $(0, 2\pi)$. **(4×3=12)**

VI

SECTION – D

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

20. Find an integrating factor and solve, $(e^{x+y} + ye^{y})dx + (xe^{y} - 1)dy = 0, y(0) = -1$.

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

22. Applying Laplace transform, solve the following system.

$$y_1' = -4y_1 - 2y_2 + t \qquad y_1(0) = 5.75,$$

$$y_2' = -3y_1 - y_2 - t \qquad y_2(0) = -6.75$$

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

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

(2x5=10)