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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.



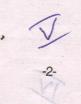
- 2. Find the Wronskian, W (x, xex).
- 3. Give the Laplace transform of tn+1.
- 4. Determine the relation between a and b if u(x, y) = f(ax + by) is a solution to $3u_x 7u_y = 0$ for any differentiable function f such that $f'(z) \neq 0$ for all real z. (4x1=4)

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.

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- 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. (7x2=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 : $u_{xx} + 9u_{yy} = 0$.
- 9. Find the Fourier series of $f(x) = (\pi x)/2$ in the interval $(0, 2\pi)$. (4×3=12)



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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.

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

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

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)