K16U 2115

Reg. No. : ....

Name : ....

Third Semester B.Sc./B.C.A. Degree (CBCSS – Reg./Supple./Imp.) Examination, November 2016
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS FOR B.C.A.
3C03 MAT-BCA : Mathematics for BCA – III

Time : 3 Hours   Max. Marks : 40

SECTION – A

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

1. Solve : $y' = e^{x-y} + x^2e^{-y}$.

2. Find the general solution of $y'' - y = 0$.

3. Find the Laplace transform of $t^2 - 2t$.

4. Find the relation between a and b if $u(x, t) = e^{ax + bt}$ is a solution to the PDE $u_t = u_{xx}$.

(4×1=4)

SECTION – B

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

5. Solve : $y' + y \tan x = \cos^3 x$.

6. Show that the equation, $(1 + 4xy + 2y^2)dx + (1 + 4xy + 2x^2)dy = 0$ is exact and solve it.

7. Find the orthogonal trajectories of the family of curves, $x^2 - y^2 = c$.

8. Find the solution to the initial value problem, $-2y'' + y' + y = 0$, $y(1) = 0$, $y'(1) = 1$.

P.T.O.

9. Using Laplace transform, solve the following initial value problem.

   $y'' - y = t$, $y(0) = 1$, $y'(0) = 1$.

10. Find the inverse transform of $\frac{3s+1}{(s-1)(s^2+1)}$.

11. Find the first order PDE, by eliminating the arbitrary constants a and b, satisfied by u where $u(x, y) = ax + by$.

12. Solve the equation $u_x = 1$ subject to the initial condition $u(0, y) = y$.

13. Show that $u(x, y) = e^{-y} f(x - y)$ is the general solution of $u_x + u_y + u = 0$. **(7×2=14)**

SECTION – C

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

14. Solve the initial value problem : $y' - y = 2xe^{2x}$, $y(1) = 0$.

15. Solve : $y'' - 3y' + 2y = \sin 3x$.

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

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

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

18. 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 $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + ... = \frac{\pi}{4}$.

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

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, $(x - y)dx - dy = 0$, $y(0) = 2$.

21. Solve, $y'' + y = \tan x$, 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 :

 a) the Fourier cosine series and

 b) the Fourier sine series of the function, $f(x) = \pi - x;\quad 0 < x < \pi.$ **(2×5=10)**
