III Semester B.Sc. Degree (CBCSS – Sup./Imp.) Examination, November 2020
(2014 – '18 Admns)
COMPLEMENTARY COURSE IN MATHEMATICS
3C03 MAT – BCA : Mathematics for BCA – III

Time : 3 Hours

Max. Marks : 40

SECTION – A

All the **first 4** questions are **compulsory** :

1. Solve the ODE $y' = xe^{x^2/2}$ by integration.
2. Find the general solution of $y'' + y = 0$.
3. The Laplace transform of coshat is _____
4. Give the one dimensional wave equation. **(4×1=4)**

SECTION – B

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

5. Solve $(x^2 + 1)\frac{dy}{dx} + 2xy = x^2$.
6. Solve the initial value problem
   $(e^{x+y} + ye^y)dx + (xe^y - 1)dy = 0, y(0) = -1$.
7. Solve $2xyy' = y^2 - x^2$.

P.T.O.

8. Find the particular integral of $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = \sin 3x$.

9. Find the general solution of $x^2y'' - 5xy' + 9y = 0$.

10. Find L(tcos5t).

11. Find the inverse Laplace transform of $F(S) = \frac{e^{-s}}{S^2 + \pi^2}$.

12. Write the Euler formula for finding the Fourier coefficients.

13. Solve the partial differential equation $U_{xy} = -U_x$. **(7×2=14)**

SECTION – C

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

14. Solve $(1 + y^2)dx = (\tan^{-1}y - x)\,dy$.

15. Find the orthogonal trajectory of $x^2y = C$.

16. Find the Wronskian of the solution of the differential equation $y'' - 2y' + y = 0$.

17. Find $L^{-1}\left(\frac{1}{s(s^2 + 25)}\right)$.

18. Find the Fourier series of the function

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

19. Find whether the following pde's are parabolic, elliptic or hyperbolic

i) $U_{xy} - U_{yy} = 0$

ii) $U_{xx} + 9U_{yy} = 0$

iii) $U_{xx} + U_{xy} - 2U_{yy} = 0$. **(4×3=12)**

SECTION – D

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

20. Solve $xy(1+xy^2)\frac{dy}{dx}=1$.

21. Solve by method of variation of parameters $y''-4y'+4y=x^2e^x$.

22. Solve the IVP by Laplace transform $y''-y'-6y=0,\ y(0)=6,\ y'(0)=13$.

23. Find the Fourier series to represent the function :

$$f(x)=\begin{cases} x & \text{for} \quad 0\le x\le \pi \\ 2\pi - x & \text{for} \quad \pi \le x \le 2\pi \end{cases}$$

Hence deduce $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots=\frac{\pi^2}{8}$. **(2×5=10)**
