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.

 $(4 \times 1 = 4)$

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
$$2xyy' = y^2 - x^2$$
.



- 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 $U_{xy} = -U_x$.

 $(7 \times 2 = 14)$

SECTION - C

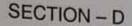
Answer any 4 questions from among the questions 14 to 19. These questions carry 3 marks each.

- 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)



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
$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$$
. (2x5=10)