

K18U 1903

Reg.	No.	:	

Name : .....

III Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.)

Examination, November 2018

(2014 Admn. Onwards)

COMPLEMENTARY COURSE IN MATHEMATICS
3C03 MAT-ST: Mathematics for Statistics – III

Time: 3 Hours Max. Marks: 40

## SECTION - A

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

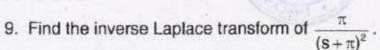
- 1. Solve:  $y' = x^2 \sqrt{y}$ , y(0) = 1.
- 2. Find W(e-21, te-21).
- 3. Find the Laplace transform of cos2πt.
- 4. Give the two-dimensional wave equation.

## SECTION - B

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

- 5. Find the orthogonal trajectory of the family of curves  $x = c\sqrt{y}$ .
- 6. Find the general solution to  $x^3y' + 3x^2y = 5 \sin h10x$ .
- 7. Solve:  $(2x + 1/y y/x^2)dx + (2y + 1/x x/y^2) dy = 0$ .
- 8. Determine whether the equation,  $3y'' + 2y' + y = x^5$  is linear or nonlinear. If it is linear, write it in standard form and state whether it is homogeneous or nonhomogeneous.

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- 10. Find  $\mathcal{L}(f)$  if f(t) equals  $\cos^2 \pi t$ .
- 11. Find the Fourier series of the following function which is assumed to have the period  $2\pi$ .

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

- 12. Solve for  $u = u(x, y) : u_{yy} + 16u = 0$ .
- 13. Show that  $u = \cos x \sin y$  satisfies the Poisson equation with  $f = -2 \cos x \sin y$ .

### SECTION - C

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

- 14. Solve by reducing to separable form,  $2xyy' = y^2 x^2$ .
- 15. Solve the initial value problem :

$$y'' - 2y' = 12e^{2x} - 8e^{-2x}$$
,  $y(0) = -2$ ,  $y'(0) = 12$ .

- 16. Solve: y'' + 2y' + 2y = 0, y(0) = 1, y'(0) = -1.
- 17. Using Laplace transform, solve :  $y(t) + 2 \int_{0}^{t} y(\tau) \cos(t \tau) d\tau = \cos t$ .
- 18. Find the Fourier series of the function f of period 4 where

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

19. Find the type, transform to normal form and solve :  $xu_{xy} - yu_{yy} = 0$ .

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#### SECTION - D

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

- 20. If in a population of bacteria the birth rate and death rate are proportional to the number of individuals present, what is the population as a function of time?
- 21. Solve  $(x^2D^2 + xD \frac{1}{4}I)$   $y = 3x^{-1} + 3x$  by variation of parameters.
- 22. Applying Laplace transform, solve the following system.

$$y_1' = -\frac{8}{100}y_1 + \frac{2}{100}y_2 + 6$$
,  $y_1(0) = 0$ ,

$$y_2' = \frac{8}{100}y_1 - \frac{8}{100}y_2$$
  $y_2(0) = 150.$ 

Find (a) the Fourier cosine series and (b) the Fourier sine series of the function f defined by

$$f(x) = \begin{cases} 1 & \text{if } 0 < x < 1 \\ 2 & \text{if } 1 < x < 2 \end{cases}$$