Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – Sup./Imp.)
Examination, November 2020
(2014 –'18 Admns.)
COMPLEMENTARY COURSE IN MATHEMATICS
3C03MAT – PH : Mathematics for Physics and Electronics – III

Time : 3 Hours   Max. Marks : 40

SECTION – A

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

1. Verify that $y = cx^3$ is a solution of $xy' = 3y$.

2. Check the linear independence of $\sin 2x$ and $\cos 2x$.

3. Define Dirac delta function.

4. Examine whether $f(x) = |x|$ is odd, even or neither odd nor even.   **(4×1=4)**

SECTION – B

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

5. Solve $y' = (1 + x)(1 + y^2)$.

6. Represent the family of curves $xy = c$ by differential equation.

7. Find the integrating factor of $y' + y \tan x = \cos^3 x$.

8. Solve $y'' + 4y = \sin 3x$.

9. Using the definition, find the Laplace transform of $\sin \omega t$.

10. Find the inverse Laplace transform of $\dfrac{e^{-3s}}{(s-1)^4}$.

11. Verify that $u = x^2 - y^2$ is a solution of the two dimensional Laplace equation $u_{xx} + u_{yy} = 0$.

12. Solve $u_{xx} - u_{yy} = 0$.

13. Find a_0 of the Fourier series of $f(x) = x + x^2, -\pi < x < \pi$.

(7×2=1₄

SECTION – C

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

14. Solve the initial value problem $y' + 5y = 20; y(0) = 2$.

15. Find the Fourier series expansion of $f(x) = 2x, -1 < x < 1$.

16. Use the method of reduction of order to solve $x^2 y'' - 5x y' + 9y = 0$, given that $y = x^3$ is a solution.

17. Using convolution, find the inverse Laplace transform of $\dfrac{1}{s^2(s-1)}$.

18. Solve $y'' - 3y' + 2y = 4x$.

19. Find a solution $u(x, y)$ of the equation $y^3 u_x + x^2 u_y = 0$ by separating variables.

(4×3=1₂

SECTION – D

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

20. Find the orthogonal trajectories of the family of parabolas $y = cx^2$.

21. Find a second order homogeneous linear differential equation for which x^2 and $x^2 \ln x$ are solutions.

22. Solve using Laplace transform $y'' + y = t, y(0) = 1, y'(0) = -2$.

23. Find the Fourier series of $f(x) = \begin{cases} 1 & \text{if } -\pi < x < 0 \\ -1 & \text{if } 0 < x < \pi \end{cases}$.

(2×5=10