Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS – Reg./Sup./Imp.) Examination, November 2018
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN MATHEMATICS
3C03MAT-CS : Mathematics for Computer Science – III

Time : 3 Hours   Max. Marks : 40

SECTION – A

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

1. Solve the differential equation, $\dfrac{dy}{dx} = \dfrac{6x^2}{2y + \cos y}$.

2. Find $W(\cos^2 \theta, \ 1 + \cos 2\theta)$.

3. Find the Laplace transform of $9 - 6t^2$.

4. What can you say about the fundamental period of the function $f = $ constant ?

$$(4\times1=4)$$

SECTION – B

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

5. Does the initial value problem $(x - 1)y' = 2y, \ y(1) = 1$ have a solution ? Justify your answer.

6. Solve, $(\cos y \sinh x + 1)dx - \sin y \cosh x \ dy = 0$.

7. Find the orthogonal trajectories of the family of straight lines, $y = cx$.

P.T.O.
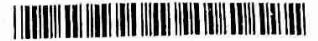
8. Solve : $y'' + \pi y' = 0$, $y(0) = 3$, $y'(0) = -\pi$.

9. Find the inverse Laplace transform of $\dfrac{2s + 16}{s^2 - 16}$.

10. Applying Laplace transforms, solve the initial value problem :

$$y' + \frac{1}{2}y = 17\sin 2t, \ y(0) = -1 .$$

11. Find the Fourier series of the following function which is assumed to have the period 2π.

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

12. Solve for $u = u(x, y)$: $u_{xx} = 4y^2 u$.

13. Find the value of c in the one dimensional wave equation such that $u = \sin 3x \sin 18t$ is a solution to it.

(7×2=14)

SECTION – C

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

14. Find the general solution to $y' = x(y - x^2 + 1)$.

15. Solve the initial value problem :

$$y'' - y' - 12y = 144x^3 + 12.5, \ y(0) = 5, \ y'(0) = -0.5.$$

16. Solve : $y'' + 25y = 2\sin 5x$.

17. Using Laplace transforms solve, $y'' + 2y' + y = e^{-t}$, $y(0) = 0$, $y'(0) = 1$.

18. Find the Fourier series of $f(x) = (\pi - x)/2$ in the interval $(0, 2\pi)$.

19. Find the type, transform to normal form and solve : $u_{xx} + 2u_{xy} + 5u_{yy} = 0$.

(4×3=12)

SECTION – D

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

20. Suppose that in Winter the daytime temperature in a certain office building is maintained at 70°F. The heating is shut off at 10 pm and turned on again at 6 am. On a certain day the temperature inside the building at 2 am was found to be 65°F. The outside temperature was 50°F at 10 pm and had dropped to 40°F by 6 am. What was the temperature inside the building when the heat was turned on at 6 am ?

21. Solve : $(D^2 + 4I) y = \cosh 2x$.

22. Applying Laplace transform, solve the following system.

$$y_1' = 4y_2 - 8\cos 4t, \quad y_1(0) = 0$$
$$y_2' = -3y_1 - 9\sin 4t, \quad y_2(0) = 3$$

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

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

(2×5=10)