K19U 2474

Reg. No. : ....

Name : ....

III Semester B.Sc. Degree (CBCSS - Reg./Supple./Imp) Examination,
November - 2019

(2014 Admn. Onwards)

COMPLEMENTARY COURSE IN MATHEMATICS

3C03 MAT- PH : MATHEMATICS FOR PHYSICS AND ELECTRONICS-III

Time : 3 Hours

Max. Marks : 40

SECTION-A

All the first **four** questions are compulsory. They carry 1 mark each.(4×1=4)

1. Obtain the differential equation associated with the primitive y=A sin 5x+B cos 5x.

2. What is the Laplace transform of cosat.

3. Write the Fourier coefficients of an even function in $(-\pi, \pi)$.

4. Solve $\dfrac{d^2y}{dx^2} + 5\dfrac{dy}{dx} + 6y = 0$.

SECTION-B

Answer any **seven** questions from among the questions 5 to 13. These questions carry 2 marks each.   (7×2=14)

5. Solve the initial value problem $\dfrac{dy}{dx} = x^{1/3}$, y(1)=2.

6. Solve $\dfrac{dy}{dx} + 3y = e^{-2x}$.

7. Show that the differential equation (2xy+y-tany)dx+(x²-xtan²y+sec²y+2)dy=0 is exact and solve it.

8. Solve the initial value problem $y'' - 4y' + 4y = 0$, y(0)=3, $y'(0) = 1$.

9. Find a general solution of $5y'' - 4y' + 4y = 0$.

10. Solve $x^2y'' - 2.5xy' - 2y = 0$.

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11. Find $L(t^n)$, where L denotes the Laplace transform operator.

12. Find the inverse Laplace transform of $\dfrac{6s-4}{s^2-4s+20}$.

13. Show that the functions $u=e^x\cos y$ and $v=e^x\sin y$ are solutions of the two dimensional Laplace equation.

SECTION-C

Answer any **four** questions from among the questions 14 to 19. These questions carry **3** marks each. (4×3=12)

14. Solve $\dfrac{dy}{dx} - y\tan x = \dfrac{\sin x\cos^2 x}{y^2}$.

15. Solve $y'' + 10y' + 25y = 14e^{-5x}$.

16. Find the Laplace transform of $t^2 e^{at}$.

17. Find the Fourier series for $f(x) = \begin{cases} -1, & -\pi < x < 0 \\ 1, & 0 < x < \pi \end{cases}$.

18. Derive the one dimensional wave equation.

19. Find the Fourier cosine series of $f(x)=x+x^2$ in $(0,1)$.

SECTION-D

Answer any **two** questions from among the questions 20 to 23. These questions carry **5** marks each. (2×5=10)

20. Find the orthogonal trajectories of the family of confocal conics $\dfrac{x^2}{a^2+\lambda} + \dfrac{y^2}{b^2+\lambda} = 1$, λ being the parameter of the family.

21. Solve by method of variation of parameters $y'' + 4y = \tan 2x$.

22. Applying Laplace transform, solve the initial value problem $y'' - 3y' + 2y = 4e^{2t}$, $y(0)=-3$, $y'(0) = 5$.

23. Find D'Alembert's solution of the wave equation $\dfrac{\partial^2 u}{\partial t^2} = c^2 \dfrac{\partial^2 u}{\partial x^2}$, $c^2 = \dfrac{T}{\rho}$.