Reg. No. :

B.E./B.Tech. DEGREE EXAMINATION, AUGUST 2021

Second Semester

19UMA206- Differential Equations ,Complex analysis andTransform Techniques

Civil Engineering

(Regulation 2019)

Duration: 1.45 hrs   Maximum: 50 Marks

PART A   (Answer Any Ten)   10*2 = 20 Marks

1.   Solve $(D^3 + D^2 + 4D + 4)y = 0$ CO1- AP

2.   Calculate Particular integral of $(D^2 + 4D + 8)y = e^{2x}$ CO1- AP

3.   Reduce the equation $(x^2 D^2 + xD + 1)y = \log x$ into an ordinary differential   CO1- AP
     equation with constant co efficient.

4.   Calculate λ such that $\overline{F} = (3x - 2y + z)\vec{i} + (4x + \lambda y - z)\vec{j} + (x - y + 2z)\vec{k}$ is   CO2- AP
     solenoidal.

5.   CO6- AP
     State stokes theorem

6.   Prove that div $\vec{r} = 3$ and curl $\vec{r} = 0$ CO2- AP

7.   CO3- AP
     Calculate the general solution of $4\dfrac{\partial^2 z}{\partial x^2} - 12\dfrac{\partial^2 z}{\partial x \partial y} + 9\dfrac{\partial^2 z}{\partial y^2}$

8.   Eliminate the arbitrary constants a and b from z=ax+by+ab   CO6- U

9   Solve the equation $(D - D')^3 z = 0$ CO3- AP

10   Expand $f(z) = \log(1 + z)$ as a Taylor's series about z = 0   CO4- AP

11   CO4- AP
     Calculate the residue of $f(z) = \dfrac{e^{2z}}{(z+1)^2}$ at its pole.

12   Define singular point   CO6- AP

13   Find $L^{-1}\left[\dfrac{1}{s^2 + 6s + 9}\right]$ CO5- U

14   Find the Laplace Transform of $\dfrac{t}{e^t}$ CO5- AP

15   State the conditions under which Laplace transform of f(t) exists.   CO6- AP

<div align="center">PART B (Answer Any Three)</div> $3*10 = 30$ Marks

16.   Solve $\left(D^2 + a^2\right)y = \tan ax$ CO1App   (10)

17   Verify Green's theorem for $\int_c \left(3x^2 - 8y^2\right)dx + \left(4y - 6xy\right)dy$ CO2-App   (10)

     Where C is the boundary of the region bounded by x=y², y=x².

18   Solve $\left(D^2 + 3DD' + 2D'^2\right)z = \sin(2x + y) + e^{x+y}$ CO3- App   (10)

19   CO4- App   (10)

     Using Contour integration, to prove $\displaystyle\int_{-\infty}^{\infty}\dfrac{x^2}{(x^2 + a^2)(x^2 + b^2)}dx = \dfrac{\pi}{a+b}\,a > b > 0$

20   Solve the Laplace transform of $f(t) = \begin{cases} t, & 0 < t < a \\ 2a - t, & a < t < 2a \end{cases}$ CO5- App   (10)