A **Reg. No. :** | | | | | | | | | | |

Question Paper Code: 52002

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2024

Second Semester

Civil Engineering

15UMA202- ENGINEERING MATHEMATICS-II

(Common to All branches)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. How will You convert Cauchy's Homogeneous linear differential equation to a linear differential equation with constants Coefficients? CO1-R

   (a) z = log x (b) x =log z (c) $z = e^x$ (d) z = cos x

2. How will You convert Legendre's linear differential equation to a linear differential equation with constants Coefficients? CO1-R

   (a) z = log (ax+b) (b) ax+b =log z (c) $z = e^{(ax+b)}$ (d) z = cos (ax+b)

3. $\nabla(r^n)$ =? CO2-R

   (a) $\vec{r}$. (b) $r^{n-2}\vec{r}$. (c) $nr^{n-2}\vec{r}$. (d) nr^{n-2}.

4. div$\left(\frac{\vec{r}}{r}\right)$ =? CO2-R

   (a) $\frac{1}{r}$ (b) $\frac{2}{r}$ (c) $\frac{r}{r}$ (d) $\frac{2}{r}r^n$

5. $u = 3x^2y - y^3$ is CO3-R

   (a) non - harmonic (b) harmonic (c) differentiable (d) non -differentiable

6. The image of the line $x = 2$ under the transformation $w = \frac{1}{z}$ CO3-R

   (a)1/4 (b)1/2 (c)1/9 (d)1/16

7. Find Value of $\int_C \frac{z}{z-2}\,dz$, where C is the circle $|z-2|=\frac{3}{2}$ CO4-R

(a) 2πi (b) 6πi (c) 4πi (d) 7πi

8. The Poles of $f(z)=\frac{4}{Z^3(z-2)}$ CO4-R

(a)1,2,0,3 (b) 2,0,0,0 (c)4,0,0,0 (d)3,0,0,0

9. The L[e^{at}] is CO5-R

(a)1/s-a (b)s/s-a (c)a/s-a (d)1/s+a

10. The $L^{-1}[s/s^2+a^2]$ is CO5-R

(a) cos hat (b) sin hat (c) sin at (d) cos at

PART – B (5 x 2= 10Marks)

11. Transform $(x^2D^2$ + x D +1) y=0 into differential equation with constant coefficients, where D=$\frac{d}{dx}$. CO1-R

12. If $\overrightarrow{F}=x^3\vec{\imath}+y^3\vec{\jmath}+z^3\vec{k}$, find div (curl$\vec{F}$). CO2-R

13. Show that the function $y+e^x\cos y$ is harmonic CO3-R

14. Evaluate $\int_C \frac{cos\pi z^2}{(z-1)(z-2)}\,dz$ where C is $|Z|=3/2$. CO4-R

15. Find the Laplace transform of f(t)=$cos^3 3t$ CO5-R

PART – C (5 x 16= 80Marks)

16. (a) Solve (D^2+a^2) y = tan x by the method of variation of parameters. CO1-App (16)

Or

(b) Solve $(2x-1)^2\frac{d^2y}{dx^2}+(2x-1)\frac{dy}{dx}-2y=8x^2-2x+3$ CO1-App (16)

17. (a) Verify Green's theorem in theorem in the plane for $\int_C (3x^2-8y^2)dx+(4y-6xy)dy$ where C is the boundary of the region defined by $x=y^2, y=x^2$. CO2-App (16)

Or

(b) Verify Stoke's theorem for the function $\vec{F}=x^2\vec{\imath}+xy\vec{\jmath}$ integrated round the square in the $z=0$ plane whose sides are along the lines $x=0, y=0, x=a, y=a$. CO2-App (16)

18. (a) If $f(z) = u + iv$ is an analytic function of z and $u - v = \frac{\cos x + \sin x - e^{-y}}{2(cos\, x - \cosh y)}$, find $f(z)$ given that $f\left(\frac{\pi}{2}\right) = 0$. CO3-Ana (16)

Or

(b) Find the bilinear transformation which maps the points $-2,0,2$ into the points $w = 0, i, -i$ respectively. CO3 Ana (16)

19. (a) Using Cauchy's integral formula, evaluate $\int_C \frac{1}{Z^2-1}\, dz$ where C is the circle with centre at Z=0 and radius 2. CO4-Ana (16)

Or

(b) Using contour integration, evaluate $\int_{-\infty}^{\infty} \frac{xdx}{(x+1)(x^2+1)}$ CO4-Ana (16)

20. (a) Find the Laplace transform of CO5-App (16)

(i) sin2t sin3t
(ii) $cos^2 3t$
(iii) $sin^2 2t$

Or

(b) Solve by using laplace transform $(D^2 + 9) = cos2t$ given that $y(0) = 1, y\left(\frac{\pi}{2}\right) = -1$. CO5-App (16)