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Reg. No. : | | | | | | | | | | |

Question Paper Code: 52002

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

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. If y_1 and y_2 are the only two solutions of $\frac{d^n y}{dx^n} + k_1 \frac{d^{n-1}y}{dx^{n-1}} + k_2 \frac{d^{n-2}y}{dx^{n-2}} + \cdots + k_n y = 0$ then ___ is also it's solution — CO1 -R

   (a) $c_1y_1 + c_2y_2$ Where c_1 & c_2 are constants
   (b) y_1y_2
   (c) cy_1y_2, where c is constant
   (d) $\frac{y_1}{y_2}$

2. The complementary function of $(D^2 + 4)y = \tan 2x$ is — CO1 -R

   (a) $c_1e^{2x} + c_2e^{-2x}$ Where c_1 & c_2 are arbitrary constants
   (b) $c_1 \cos 2x + c_2 \sin 2x$ Where c_1 & c_2 are arbitrary constants
   (c) $(c_1 + c_1x)e^{2x}$ Where c_1 & c_2 are arbitrary constants
   (d) $2c_1x - 2c_2x$ Where c_1 & c_2 are arbitrary constants

3. The directional derivative of $xy^3 + yz^3$ at the point (2,-1,1) in the direction $\vec{i} + 2\vec{j} + 2\vec{k}$ — CO2 -R

   (a) $-3\frac{2}{3}$
   (b) $3\frac{2}{3}$
   (c) $-\frac{2}{3}$
   (d) $\frac{2}{3}$

4. $curl\ grad\ f$= — CO2 -R

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

5. The function which is analytic is — CO3 -R

   (a) $\sin z$
   (b) $\bar{z}$
   (c) $Im(z)$
   (d) $Real(iz)$

6. If $2x - x^2 + ay^2$ is to be harmonic, then a should be — CO3 -R

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

7. $\int_{|z-a|=r} \frac{dz}{z-a} =$ CO4 -R

(a) πi (b) 2π (c) $2\pi i$ (d) π

8. A pole of ___ order is called a simple pole CO4 -R

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

9. $L\{\sinh at\} =$ CO5- R

(a) $\frac{a}{s^2+a^2}$ (b) $\frac{a}{s^2-a^2}$ (c) $\frac{s}{s^2-a^2}$ (d) $\frac{s}{s^2+a^2}$

10. $L^{-1}\left\{\frac{s^2-3s+4}{s^3}\right\} =$ CO5 -R

(a) $1-3t-2t^2$ (b) $1+3t-2t^2$ (c) $1+3t+2t^2$ (d) $1-3t+2t^2$

PART – B (5 x 2= 10Marks)

11. Define Cauchy's homogeneous linear equation CO1- R
12. If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ then find $\nabla.\vec{r}$ CO2- R
13. If $w = \log z$, find $\frac{dw}{dz}$ CO3 -R
14. Define Laurent's series CO4- R
15. If $f^{'}(t)$ is continuous and $L\{f(t)\} = f(s)$ then find $L\{f'(t)\}$ CO5 -R

PART – C (5 x 16= 80Marks)

16. (a) Solve by the method of variation of parameters, $y^{''} - 2y^{'} + y = e^x \log x$ 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 for $\int_C[(xy+y^2)dx + x^2dy]$ where C is bounded by $y = x$ and $y = x^2$ CO2- App (16)

Or

(b) Verify Stoke's theorem for $F = (x^2+y^2)I - 2xyJ$ taken around the rectangle bounded by the lines $x = \pm a, y = 0, y = b$ CO2 -Ana (16)

18. (a) If $f(z)$ is an analytic function with constant modulus, show that $f(z)$ is constant CO3 -Ana (16)

Or

(b) Determine the analytic function $f(z) = u + iv$, if $u - v = \frac{\cos x + \sin x - e^{-y}}{2(\cos x - \cosh y)}$ and $f(\pi/2) = 0$ — CO3 -Ana (16)

19. (a) Verify Cauchy's theorem by integrating e^{iz} Along the boundary of the triangle with the vertices at the points $1 + i, -1 + i$ and $-1 - i$. — CO4- U (16)

Or

(b) Find the Laurent's expansion of $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in the region $1 < z + 1 < 3$. — CO4 -Ana (16)

20. (a) Find the inverse Laplace transforms of the following: — CO5- U (16)

(i) $\log \frac{s+1}{s-1}$ (ii) $\log \frac{s^2+1}{s(s+1)}$ (iii) $\cos^{-1}\left(\frac{s}{2}\right)$ (iv) $\tan^{-1}\left(\frac{2}{s^2}\right)$

Or

(b) Solve $ty'' + 2y' + ty = \cos t$ given that $y(0) = 1$. — CO5 -U (16)