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

Question Paper Code: 41022

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2017

Second Semester

Civil Engineering

14UMA202 - ENGINEERING MATHEMATICS – II

(Common to ALL branches)

(Regulation 2014)

Duration: Three hours | Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The roots of $(D^2+2)y$ are

   (a) ± 2 (b) $\pm 2i$ (c) $\pm i\sqrt{2}$ (d) $\sqrt{2}$

2. The particular integral of $(4D^2 - 4D + 1)y = 4$ is

   (a) -4 (b) 4 (c) -2 (d) -3

3. The gradient of a scalar function is defined as

   (a) $\nabla/\emptyset$ (b) $\nabla * \emptyset$ (c) $\emptyset\nabla$ (d) $\nabla\emptyset$

4. If $\emptyset$ is constant,then $\nabla\emptyset$ is

   (a) $2\vec{i}+\vec{j}$ (b) -1 (c) 0 (d) 1

5. The derivative of f(z) at z_0 is

   (a) l (b) f(z) (c) $f(z_0)$ (d) $f'(z_0)$

6. The invariant points of $w = \frac{2z-5}{z+4}$ are

   (a) $z = 2, -1$ (b) $z = -1 \pm 2i$ (c) $z = 0,1$ (d) $z = 2 \pm 3i$

7. The singular point of $f(z) = \frac{1}{z}$ is

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

8. In $f(z) = \frac{z}{(z-1)^3}$ the point z=1 is a pole of order

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

9. The value of $L[t^3]$ is

(a) $\frac{3}{s^3}$ (b) $\frac{6}{s^3}$ (c) $\frac{6}{s^4}$ (d) $\frac{3}{s^4}$

10. Laplace transforms is an ________ transform.

(a) Discrete (b) Discrete time
(c) Data independent (d) Integral

PART - B (5 x 2 = 10 Marks)

11. Solve $(D^4 - 2D^3 + D^2)y = 0$.

12. Find $grad\ \phi$ at (1,0,2) where $\phi = x^2y + 2xz^2 - 8$.

13. Find the values of a & b such that the function $f(z) = x^2 + ay^2 - 2xy + i(bx^2 - y^2 + 2xy)$ is analytic.

14. Find the Taylor's series for $sinz$ about $z = \frac{\pi}{4}$..

15. Find the Laplace Transform of $e^{-5t}t^2$.

PART - C (5 x 16 = 80 Marks)

16. (a) (i) Solve the equation $(1+2x)^2y'' - 6(1+2x)y' + 16y = 8(1+2x)^2$. (8)

(ii) Solve the equation $(D^2 + 4D + 3)y = e^{-x}sinx$. (8)

Or

(b) (i) Solve the equation $(x^2D^2 - 2xD + 4)y = x^2 + 2logx$. (8)

(ii) Solve the equation by Method of variation of parameter $(D^2 + a^2)y = \sec ax$. (8)

17. (a) Verify Gauss divergence theorem for $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ over the cube $0 \le x \le 1,\ 0 \le y \le 1,\ 0 \le z \le 1$. (16)

Or

(b) Verify Green's theorem for $\oint_C (xy + y^2)dx + x^2dy$ where C is the boundary of the area between $y = x^2$ and $y = x$. (16)

18. (a) Find the Bilinear transformation that maps z= ∞, I, 0 in to the points w= 0, -i, ∞ respectively. Also find its fixed Points. (16)

Or

(b) Find the image of $|z - 2i| = 2$ under the mapping $w = \frac{1}{z}$. (16)

19. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{2+cos\theta}$ by contour integration. (16)

Or

(b) Evaluate $\int_0^{\infty} \frac{x^2}{(x^2+a^2)(x^2+b^2)} dx, a > 0, b > 0$. (16)

20. (a) (i) Find the Laplace Transform of the square-wave function of period 'a' given by

$$f(t) = \begin{cases} 1, & 0 < t < \frac{a}{2} \\ -1, & \frac{a}{2} < t < a \end{cases}$$

(8)

(ii) Using Convolution theorem evaluate $L^{-1}\left[\frac{1}{(s+1)(s+2)}\right]$. (8)

Or

(b) (i) Solve $y'' + 4y' + 4y = e^{-t}$, y(0)= 0 and $y'(0) = 0$ using Laplace transform. (8)

(ii) Compute $y(1,1)$ by using Runge-Kutta method of fourth order, given $\frac{dy}{dx} = y^2 + xy, y(1) = 1$. (8)