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

Question Paper Code: 31012

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

First Semester

Civil Engineering

01UMA102 - ENGINEERING MATHEMATICS - I

(Common to All Branches)

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State Cayley – Hamilton theorem and its uses.
2. Prove that, if A is orthogonal then A^T and A^{-1} are orthogonal.
3. Find the center and radius of the sphere $3(x^2+y^2+z^2)–2x–3y–4z–22=0$.
4. Define the right circular cylinder.
5. Find the curvature of the curve $2x^2+2y^2+5x-2y+1=0$.
6. Find the radius of curvature for $y = e^x$ at the point where it cuts the Y- axis (or) at x=0.
7. Find the envelope of the family of curve $y = mx + \frac{a}{m}$.
8. If $(\cos x)^y = (\sin y)^x$ find $\frac{dy}{dx}$.
9. Evaluate $\int_0^1 \int_0^{x^2} (x^2 + y^2)\,dydx$.
10. Evaluate $\int_0^1 \int_0^2 \int_0^e dz\,dy\,dx$.

PART – B (5 X 16 = 80marks)

11. (a) Find the Eigen values and Eigenvectors of the matrix $A=\begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$. (16)

Or

(b) Reduce the quadratic form *2xy+2yz+2zx* to a canonical form by orthogonal reduction. Also find the rank, index, signature and nature of the quadratic form. (16)

12. (a) Find the center, radius and area of the circle $x^2+y^2+z^2-2x-4y-6z-2=0$, $x+2y+2z=20$. (16)

Or

(b) Find the equation of the right circular cylinder of radius 2 whose axis is the line $\frac{x-1}{2}=\frac{y-2}{1}=\frac{z-3}{2}$. (16)

13. (a) Find the radius of curvature at the point $\left(\frac{3a}{2},\frac{3a}{2}\right)$ on the curve $x^3+y^3=3axy$. (16)

Or

(b) Find the envelope of $\frac{x}{a}+\frac{y}{b}=1$ where the parameters '*a*' and '*b*' are connected by the relation $a+b=c$. (16)

14. (a) If $u=2xy$, $\vartheta=x^2-y^2$ where if $x=r\cos\theta$, $y=r\sin\theta$ find $\frac{\partial(u,\vartheta)}{\partial(r,\theta)}$. (16)

Or

(b) Expand $e^x \cos y$ in powers of *x* and *y* as far as the terms of third degree using Taylor's expansion. (16)

15. (a) Change the order of the integration and hence evaluate $\int_0^1\int_{x^2}^{2-x} xy\ dxdy$. (16)

Or

(b) Find the volume of the tetrahedron bounded by the planes *x=0, y=0, z=0* and $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}=1$. (16)