

I B. Tech. II Semester Supplementary Examinations, November - 2021

MATHEMATICS-III

(Com to AE,AME,CE,CSE,IT,EIE,EEE,ME,ECE, Metal E, Min E, E Com E, Agri E, Chem. E, PCE,PE)

Time: 3 hours

Max. Marks: 70

- Note: 1. Question paper consists of two parts (**Part-A** and **Part-B**)
 2. Answering the question in **Part-A** is Compulsory
 3. Answer any **FOUR** Questions from **Part-B**

PART -A

1. a) Define PAQ form of the matrix. (2M)
- b) Write the matrix form of the quadratic form $x^2 + 2y^2 + 2z^2 + 5xy + 7yz + 10xz$ (2M)
- c) Find the Eigen value of $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -2 & 3 \\ 0 & 0 & 1 \end{bmatrix}$ (2M)
- d) Define volume integral. (2M)
- e) Define beta function. (2M)
- f) Find the $\nabla(x^2 + y^2 + 2z)$ (2M)
- g) Find the area between the curves $x = f(y)$ and $x = g(y)$ (2M)

PART -B

2. a) Find the rank of $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$ by Echelon form. (7M)
- b) Solve the system of equations $x + y + z = 6, x - y + 2z = 5, 3x + y + z = 8, 2x - 2y + 3z = 7$ by Gauss elimination method. (7M)
3. a) Prove that Eigen values of real symmetric matrix are real (7M)
- b) Find Rank index and signature of quadratic form $10x^2 + 2y^2 + 5z^2 - 4xy - 10xz + 6yz$ by diagonalization method. (7M)
4. a) Trace the curve $ay^2 = x^2(a - x)$ (7M)
- b) Evaluate $\int \int_R (\sqrt{xy} - y^2) dx dy$ where R is a triangle with vertices $(0,0), (1, 0), (1, 1)$ (7M)
5. a) Evaluate $\int_0^1 (x \log x)^4 dx$ (7M)
- b) Show that $\int_0^2 x^3 \sqrt{1 - 4x^2} dx = \frac{1}{120}$ (7M)

6. a) Find the directional derivative of $\phi = xy + yz + zx$ at A in the directional of \overline{AB} (7M)
where $A(1, 2, -1)$ and $B(1, 2, 3)$
- b) Prove that $r^n \overline{r}$ irrotational. (7M)
7. a) Using Divergence theorem Evaluate $\iint_S \overline{F} \cdot \overline{n} ds$ where s is the surface of the sphere (7M)
 $x^2 + y^2 + z^2 = b^2$ in the first octant where $\overline{F} = y\overline{i} + z\overline{j} + x\overline{k}$.
- b) Find the circulation of F round the curve C where $\overline{F} = e^x \sin y \overline{i} + e^x \cos y \overline{j}$ and c is (7M)
the rectangle whose vertices are $(0,0)$ $(1,0)$, $(1, \pi/2)$, $(0, \pi/2)$.