Code No: R13202 **R13** **SET-1**

I B. Tech II Semester Supplementary Examinations, April/May - 2019
MATHEMATICS-III
(Com. to all branches)

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 **THREE** Questions from **Part-B**

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PART –A

1. a) Find the Rank of the matrix $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ using Echelon form. (3M)

b) If λ is an Eigen value of a non singular matrix A. Show that |A| / λ is an Eigen value of the adj A (3M)

c) Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dxdy$ (4M)

d) Prove that $\beta(m,n) = \beta(m+1,n) + \beta(m,n+1)$ (4M)

e) Prove that $\nabla\left(\frac{1}{r}\right) = \frac{-\bar{r}}{r^3}$ (4M)

f) Find the work done in moving particle in the force field $\bar{F} = 3x^2\,\bar{i} + \bar{j} + z\bar{k}$ along the straight line (0, 0, 0) to (2, 1, 3) (4M)

PART –B

2. a) Solve the equations $5x + y + z + w = 4, x + 7y + z + w = 12, x + y + 6z + w = -5, x + y + z + 4w = -6.$ by Gauss-seidal method. (8M)

b) Test for consistency and solve $5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5.$ (8M)

3. a) If A= $\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ Verify Cayley Hamilton theorem. Find A^4 (8M)

b) Find the Characteristic roots and Eigen vectors of the matrix A= $\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ (8M)

4. a) Solve $\int_{-1}^{1} \int_{0}^{\sqrt{1-y^2}} \int_{x^2+y^2}^{\sqrt{x^2+y^2}} dx\,dy\,dz$ (8M)

b) Evaluate $\int_0^a \int_y^a \frac{x\,dx\,dy}{x^2 + y^2}$ by change of order of Integration. (8M)
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5\. a) Show that $\beta(m,n) = a^m b^m \int_0^\infty \frac{x^{m-1}}{(ax+b)^{m+n}} dx$ (8M)

b) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\cot\theta}\, d\theta$ (8M)

6\. a) Find the directional derivative of the function $e^{2x}\cos yz$ at the origin in the direction to the tangent to the curve $x = a\sin t, y = a\cos t, z = at$ at $t = \frac{\pi}{4}$ (8M)

b) Prove that $curl\ grad\phi = 0$. (8M)

7\. a) Evaluate $\iint_s (\nabla \times \overline{F}).\overline{n}\, ds$ where $\overline{F} = (x^2 + y - 4)\overline{i} + 3xy\,\overline{j} + (2xy + z^2)\overline{k}$ and s in the surface of the paraboloid $z = 4 - x^2 - y^2$ above the xy plane using stoke's theorem. (8M)

b) Verify Green's theorem for scalar line integral of $f = (x^2 + y^2)\,\overline{i} - 2xy\,\overline{j}$ around the Rectangle determined by the lines $x = \pm a$; $y = 0$; $y = b$. (8M)