Code No: R161203 **R16** SET - 1

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2019
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**

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PART –A

1. a) If $A = \begin{bmatrix} 123 \\ 246 \\ 4812 \end{bmatrix}$ then find rank of A. (2M)

   b) If 1,2,3 are the Eigen values of matrix A , then Eigen values of A^{-1} . (2M)

   c) What is the Nature of the quadratic form If 1 0,-1 are Eigen values of form the quadratic form. (2M)

   d) What is an asymptote of the curve? (2M)

   e) Find $\beta(1,1)$ (2M)

   f) Prove that $3y^4z^2\bar{i} + z^3x^2\bar{j} - 3x^2y^2\bar{k}$ is a solenoidal vector. (2M)

   g) State Gauss divergence theorem. (2M)

PART -B

2. a) Solve the equations $x + y - 2z + 3w = 0, x - 2y + z - w = 0, 4x + y - 5z + 8w = 0, 5x - 7y + 2z - w = 0.$ (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 Jordan method. (7M)

3. a) Verify Cayley -Hamilton theorem for $A=\begin{bmatrix} -1 & 2 & -2 \\ 1 & 2 & 1 \\ -1 & -1 & 0 \end{bmatrix}$ also find A^{-1} (7M)

   b) Find Rank index and signature of quadratic form $10x^2 + 2y^2 + 5z^2 - 4xy - 10xz + 6yz$ by orthogonal reduction. (7M)

4. a) Trace the curve $ay^2 = x^2(a - x)$ (7M)

   b) Find the volume of the sphere $x^2 + y^2 + z^2 = a^2$ using triple integration. (7M)
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5. a) Evaluate $\int_0^\infty x^6 e^{-2x} dx$ (7M)

b) Show that $\int_0^\infty \frac{x^a}{a^x} dx = \frac{\Gamma(a+1)}{(\log a)^{a+1}} (a > 1)$ (7M)

6. a) if $\overline{f}$, ϕ be differentiable vector and scalar functions respectively, then prove that $\nabla.(\phi \overline{f}) = (\nabla \phi).\overline{f} + \phi(\nabla.\overline{f})$ (7M)

b) Prove that $\nabla\left(r\nabla\left(\frac{1}{r^3}\right)\right) = \frac{3}{r^4}$ (7M)

7. a) Apply Green's theorem to evaluate $\oint_C (2xy - x^2)dx + (x^2 + y^2)dy$ where C is bounded by $y = x^2$ and $x = y^2$. (7M)

b) If $\vec{F} = 6z\,\vec{i} + (2x + y)\vec{j} - x\,\vec{k}$, then Evaluate $\iint_S \vec{F} \cdot \hat{n}\, ds$ where S is the region bounded by the cylinder $x^2 + y^2 = 9,\ x = 0, y = 0, z = 0\ and\ y = 8$. (7M)