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

I B. Tech II Semester Supplementary Examinations, July/August - 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**

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PART –A

1. a) Define Echelon form. (2M)
   b) Write the matrix form of the quadratic form $x^2+2y^2+z^2+2xy+4yz+8xz$ (2M)
   c) Find the Eigen value of $A=\begin{bmatrix}1&0&0\\0&2&3\\0&0&1\end{bmatrix}$ (2M)
   d) Define surface integral. (2M)
   e) Define Gamma function. (2M)
   f) Find the $Curl(\bar{r})$ (2M)
   g) Find the area between the curves y = f(x) and y = g(x) (2M)

PART -B

2. a) Find the rank of matrix $\begin{bmatrix}0&1&-3&-1\\1&0&1&1\\3&1&0&2\\1&1&2&0\end{bmatrix}$ by reduce to Normal form. (7M)
   b) Solve the system of equations x+2y+(2+k)z=0,2x+(2+k)y+4z = 0,7x+13y+(18+k)z = 0, for all values of k (7M)

3. a) Verify cayley -Hamilton theorem Verify for the matrix $A=\begin{bmatrix}8&-8&-2\\4&-3&-2\\3&-4&1\end{bmatrix}$ also find A^{-1} (7M)
   b) Prove that the product of the Eigen values is equal to the determinant of the matrix. (7M)

4. a) Find the directional derivative of $\phi=x^2-2y^2+4z^2$ in the directional of $2\bar{i}+\bar{j}-\bar{k}$ at $(1,1,-1)$ (7M)
   b) Show that the vector $\left(x^2-yz\right)\bar{i}+\left(y^2-zx\right)\bar{j}+\left(z^2-xy\right)\bar{k}$ is irrotational and find its scalar potential. (7M)
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5. a) Trace the curve $r = a + b\cos\theta \ (a > b)$ (7M)

b) Evaluate $\int\int_R (x^2 + y^2)\, dy\, dx$ where R is the region bounded by the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ (7M)

6. a) Show that $\int_0^\infty \sqrt{x}\ e^{-x^3} dx = \frac{\sqrt{\pi}}{3}$ (7M)

b) prove that $\int_0^\infty \frac{x^{m-1}}{(a+bx)^{m+n}} dx = \frac{1}{a^m b^n} \beta(m,n)$ (7M)

7. a) Evaluate $\int_v \bar{F}.dv$ where $\bar{F} = x\,\bar{i} + y\,\bar{j} + z\,\bar{k}$ and v is the Region bounded by $x = 0$ $x = 2$, $y = 0$, $y = 6$, $z = 4$, $z = x^2$ (7M)

b) 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)