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

I B. Tech II Semester Supplementary Examinations, December - 2020
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**

~~~~~~

PART –A

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

b) If λ is an Eigen value of a non singular matrix A. Show that $1/\lambda$ is an Eigen value of A^{-1} (3M)

c) Evaluate $\int_0^1 \int_0^y e^{x/y}\, dx\, dy$ (4M)

d) Prove that $\beta\left(\frac{1}{2},\frac{1}{2}\right) = \pi$ (4M)

e) Prove that $\nabla(\log r) = \frac{\bar{r}}{r^2}$ (4M)

f) Evaluate $\int_C \bar{F}.d\bar{r}$ where $\bar{F} = 2x^2yz\,\bar{i} + x^2y\,\bar{j}$ where C is the curve $x = t$, $y = t^2$, $z = t^3$ from t=0 to t=1. (4M)

PART -B

2. a) Solve the system of equations by Gauss –Seidel method. (8M)
8x-3y+2z = 20; 4x+11y-z = 33 ; 6x+3y+12z =36

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

3. a) Find the Nature, Rank, index, signature of the quadratic form $2x^2 + y^2 - 3z^2 + 12xy - 4xz - 8yz$ (8M)

b) Verify Cayley Hamilton theorem and hence find A^{-1} if $A=\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ (8M)

4. a) Evaluate $\iiint_v (x^2 + y^2 + z^2)\, dx\, dy\, dz$ taken over the Region $0 \le z \le x^2 + y^2 \le 1$. (8M)

b) Evaluate by change of order of Integration $\int_{-1}^{1} \int_{0}^{\sqrt{1-x^2}} f(x, y) dy\, dy$. (8M)

|''|'||''|''|||'|| www.manaresults.co.in
~~~~~~

5. a) Show that $\int_a^b (x-a)^{m-1}(b-x)^{n-1}dx = (b-a)^{m+n-1}\beta(m,n) m>0, n>0$ (8M)

b) Evaluate: $\int_0^\infty \frac{x^6\left(1-x^{10}\right)}{\left(1+x\right)^{24}}dx$ using Beta and Gamma functions. (8M)

6. a) Find the directional derivative of the function $6x^2y+24y^2z-8z^2x$ at the $(1,1,1)$ in the direction to parallel to the line $\frac{x-1}{2}=\frac{y-3}{2}=\frac{z}{1}$ hence find the maximum value. (8M)

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. (8M)

7. a) verify stoke's theorem for the function $F = zi + xj + yk$ where c is the unit circle in the xy plane bounded by Hemi sphere $z = \sqrt{1-x^2-y^2}$ (8M)

b) Evaluate $\oint_c \cos y\,dx + x(1-\sin y)\,dy$ over a closed curve c is given by $x^2+y^2=1$; $z=0$. Using Green's theorem. (8M)

|''|'||''|''|''||||'|| www.manaresults.co.in