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

I B. Tech II Semester Supplementary Examinations, Nov/Dec - 2017

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) Reduce the matrix $A=\begin{bmatrix}0&1&2&-2\\4&0&2&6\\2&1&3&1\end{bmatrix}$ in to Echelon form and hence find the rank. (4M)

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

c) Trace the curve $r\theta = a\ (a > 0)$. (3M)

d) Show that $\int_0^{\pi/2} \sin^m\theta\cos^n\theta d\theta = \frac{1}{2}B\left(\frac{m+1}{2},\frac{n+1}{2}\right)$ (4M)

e) Find the angle between the surfaces $x^2+y^2+z^2=12$ and $x^2+y^2-z^2=6$ at $(2,-2,2)$ (4M)

f) $Evaluate$ $\int_C \overline{F}.d\overline{r}$ If $\overline{F}=(5xy-6x^2)\overline{i}+(2y-4x)\overline{j}$ along the curve C in xy plane $y = x^3$ from (1, 1) to (2,8). (4M)

PART -B

2. a) Determine whether the following equations will have a non-trivial solution if so solve them 4x+2y+z+3w=0, 6x+2y+4z+7w=0, 2x+y+w=0 (8M)

b) Test for Consistency the set of equations and solve them if they are consistent. (8M)
x+2y+2z=2; 3x-2y-z=5; 2x-5y+3z= -4; x+4y+6z=0

3. a) Reduce the quadratic form $8x^2+7y^2+3z^2-12xy-8yz+4xz$ to the canonical form hence find the rank , index and signature. (8M)

b) Determine the characteristic roots and the corresponding characteristic vectors of the matrix $A=\begin{bmatrix}8&-6&2\\-6&7&-4\\2&-4&3\end{bmatrix}$ (8M)

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4. a) Evaluate $\int_{0}^{\frac{\pi}{2}} \int_{0}^{a\cos\theta} r\sqrt{a^2-r^2}\,dr\,d\theta$ (8M)

b) Find the Length of the curve $3x^2=y^3$ between y=0 & y=1. (8M)

5. a) Evaluate $\int_{0}^{1} \frac{x^2}{\sqrt{1-x^5}}dx$ in terms of Beta-Gamma function. (8M)

b) Show that $\beta(m,n)=\frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ (8M)

6. a) Find the directional derivation of (8M)

$\varphi(x,y,z)=x^2yz+4xz^2$ at the point (1,-2,-1) in the direction of $2\bar{i}+\bar{j}-2\bar{k}$

b) If $\bar{f},\bar{g}$ are two vector point functions then show that (8M)

$\nabla\times(\bar{f}\times\bar{g})=\bar{f}(\nabla.\bar{g})-\bar{g}(\nabla.\bar{f})+(\bar{g}.\nabla)\bar{f}-(\bar{f}.\nabla)\bar{g}$

7. a) Verify Green's theorem in the plane for $\int_{C}(x^2-xy^3)dx+(y^2-2xy)dy$ where C is a square with vertices (0, 0), (2, 0), (2, 2), (0, 2). (8M)

b) Evaluate $\iint_{s} f.nds$ $where\ f=y^2i+yj-xzk$ where s is the upper half of the sphere with radius 'a' units. (8M)