

www.FirstRanker.com

_

Code No: R161203 **R16 SET** - 1
1B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
MATHEMATICS-III
(Cone to AE AME/CE/CSE,IT.EIE.EIE.EME,EICE.Metal E, Min, E, Con, E, Agri, E, Chem, E, PCE,PE)
Time: 3 hours 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**
PART-A
1. a) Find the rank of the matrix by reducing it to normal form
$$\begin{bmatrix} 3 & 2 & 1 & 5 \\ 2 & 3 & 4 & 6 \\ 3 & 5 & 0 & 10 \end{bmatrix}$$
 (2M)
b) What is the nature of the quadratic form $x^2+y^2+x^2-2xy$? (2M)
c) Write the physical significance of grad φ . (2M)
d) Find the area bounded by the upper half of the curve $r = a(1 - \cos \theta)$. (2M)
e) Prove that the work done in moving an object from P_1 to P_2 in a conservative (2M)
force field \overline{F} is independent of the path joining the two points P_1 and P_2 .
(2M)
(2M)
(2M) **EXERCISE**
2. a) Use Gauss Seidel method to solve 25x y^2 by $4zz = 69$, $2x + 10y + z = 63$, $x + y + z$ (6M)
 $= 43$.
b) Reduce the quadratic form $x^2 + 4y^2 + z^2 + 4xy + 6yz + 2zx$ to canonical form by (8M)
linear transformation. Also find singnature and rank of the quadratic form.
3. a) Find the natural frequencies and normal modes of vibrating system for which the (7M)
mass matrix is $\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and stiffness K = $\begin{bmatrix} 2 & 1 \\ 1 & 3 \\ 1 & -1 \\ 2 & -1 \\ 1 & -1 \\ 2 & -1 \\ 3 & -1 \\ 5 & a \end{bmatrix}$ Express the integral $\int_{x^2}^{x^2} dx^2 + y^2 dydx$ by changing into polar coordinates. (7M)
b) Evaluate $\int_{0}^{x^{-1}} (\sqrt{x^2 + y^2} dydx$ by changing into polar coordinates. (7M)
b) Show that $\int_{x^{-1}}^{x^{-1}} dx = \frac{B(m, n)}{a^{-1}(x + a)^{max}}$. (7M)
b) Show that $\int_{x^{-1}}^{x^{-1}} dx = \frac{B(m, n)}{a^{-1}(x + a)^{max}}$. (7M)

www.FirstRanker.com



Code No: R161203

6. a) Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point (7M) P=(1,2,3) in the direction of the line PQ where Q = (5,0,4).

b) Prove that
$$\nabla \times \left(\frac{\overline{A} \times \overline{r}}{r^n}\right) = \frac{(2-n)\overline{A}}{r^n} + \frac{n(\overline{r},\overline{A})\overline{r}}{r^{n+2}}.$$
 (7M)

7. If $\overline{F} = 4xz\overline{i} - y^2\overline{j} + yz\overline{k}$, evaluate $\int_{s} \overline{F}.\overline{n}ds$ where S is the surface of the cube (14M) bounded by x = 0, x = a, y = 0, y = a, z = 0, z = a.

| | er.com |
|----------|--------|
| | ante |
| MMM F !! | |

 $2 \ of \ 2$



www.FirstRanker.com

Code No: R161203 **R16** SET - 2
I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019
MATHEMATICS-III
(Com to AE.AME,CE,CSE,IT,EIE,EEF,ME,ECE.Metal E, Min E, E Com E, Agri E, Chem E, PCE,PF)
Time: 3 hours
Max. Marks: 70
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**
IIII
1. a) Find the rank of the matrix
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -2 & 1 \\ 3 & 0 & 4 \end{bmatrix}$$
 by reducing it into echelon form. (2M)
b) What is the nature of the quadratic form $x^2 - 2y^2 + z^2 - 2zy$? (2M)
c) Evaluate $\int_0^{1/3} \sqrt{\log \frac{1}{x}} dx$. (2M)
d) If λ is eigenvalue of an orthogonal matrix, then show that $\frac{1}{\lambda}$ is also an eigenvalue. (2M)
e) Find the area bounded by the curves $y = x$ and $y = x^2$. (2M)
f) In what direction from the point $(1, -1, 3)$ the directional derivative of (2M)
 $\phi = 2xy + z^2$ is maximum? What is the magnitude of this maximum?
g) State Gauss divergence theorem. (2M)
 $\frac{9x - 2y + z - t = 50}{-2x + 2y^2 + z^2 + z^2 + z^2}$
 $x + y - 2z + 6t = 18$
b) Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 4 \\ 2 & 1 & 3 \end{bmatrix}$ and find A^{-1} . (8M)
 $\frac{9x - 2y + z - t = 50}{-2x + 2y + z^2 + z^2 + z^2}$
 $x + y - 2z + 6t = 18$
b) Verify Cayley-Hamilton theorem for $A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 4 \\ 2 & 1 & 3 \end{bmatrix}$ and find A^{-1} . (7M)
mass matrix is $\begin{bmatrix} 2 & 0 \\ 0 & 4 \end{bmatrix}$ and stiffness $K = \begin{bmatrix} 6 & -2 \\ -2 & 9 \end{bmatrix}$.
b) Reduce the quadratic form $3x_1^2 + 3x_2^2 + 3x_3^2 + 2x_1x_3 - 2x_2x_3$ to orthogonal (7M)
transformation. Also find signature and rank of the quadratic form.
4. a) Trace the curve $y^2(a + x) = x^2(a - x)$. (7M)
b) g changing the order of integration, evaluate $\int_{0}^{1/2} f_1^2 f_2^3 f_2 f_3^2 f_3 f_3^2$.



www.FirstRanker.com

Code No: R161203
5. a) Evaluate
$$\int_{0}^{1} (8-x^{3})^{1/3} dx$$
 using β and γ functions.
b) Prove that $\Gamma\left(n+\frac{1}{2}\right) = \frac{\sqrt{\pi} \Gamma(2n+1)}{2^{2n} \Gamma(n+1)}$.
(7M)

- 6. a) Find the directional derivative of $\phi = x^2 yz + 4xz^2$ at (1, -2, -1) in the direction of (7M) $2\overline{i} - \overline{j} - 2\overline{k}$.
 - b) Prove that $\operatorname{curl}(\overline{a} \times \overline{b}) = \overline{a} \operatorname{div} \overline{b} \overline{b} \operatorname{div} \overline{a} + (\overline{b} \cdot \nabla) \overline{a} (\overline{a} \cdot \nabla) \overline{b}.$ (7M)
- 7. Verify Stoke's theorem for $\overline{F} = (2x y)\overline{i} yz^2\overline{j} y^2z\overline{k}$ over the upper half of (14M) surface of sphere $x^2 + y^2 + z^2 = 1$ bounded by the projection of the xy- plane.

www.firstRanker.com

2 of 2



| Note: 1. Question Paper consists of two parts (Part-A and Part-B) | | | | |
|---|-----|---|------|--|
| 2. Answering the question in Part-A is Compulsory3. Answer any FOUR Questions from Part-B | | | | |
| ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ | | | | |
| <u>PART –A</u> | | | | |
| 1. | a) | Find the rank of the matrix by reducing it to normal form $\begin{bmatrix} 1 & 7 & 8 & 1 \\ 1 & 3 & 4 & 2 \\ 3 & 5 & 6 & 10 \end{bmatrix}$ | (2M) | |
| | b) | What is the nature of the quadratic form $-2x^2+2y^2-z^2-2xy$? | (2M) | |
| | c) | c) Find the complete area of the curve $a^2y^2 = x^3(2a - x)$. | | |
| | d) | Evaluate $\int_{0}^{\frac{\pi}{2}} \sin^4 \theta \cos^2 \theta d\theta$. | (2M) | |
| | e) | If λ is an eigenvalue of a nonsingular matrix A, then show that $\frac{ A }{\lambda}$ is an | (2M) | |
| | | eigenvalue of adj A. | | |
| | f) | In what direction from the point (2, -1, 1) the directional derivative of $\phi = xy^2 + yz^3$ is maximum. What is the magnitude of this maximum? | (2M) | |
| | g) | State Stoke's theorem. | (2M) | |
| <u>PART -B</u> | | | | |
| 2. | a) | Apply Guass – Seidel method to solve the equations. 27x + 6y - z = 85 x + y + 54z = 110 | (6M) | |
| | 1 \ | 6x + 15y + 2z = 72 | | |
| | b) | Verify Cayley-Hamilton theorem for A = $\begin{bmatrix} 10 & 1 & 1 \\ 1 & 10 & -1 \\ 1 & -2 & 10 \end{bmatrix}$ and find A^{-1} . | (8M) | |
| 3. | a) | Find the natural frequencies and normal modes of vibrating system for which the | (7M) | |
| | | mass matrix is $\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$ and stiffness $\mathbf{K} = \begin{bmatrix} 2 & 1 \\ 1 & 3 \end{bmatrix}$. | | |
| | b) | Reduce the quadratic form $4x^2 + 3y^2 + z^2 - 8xy - 6yz + 4zx$ to orthogonal transformation. Also find signature and rank of the quadratic form. | (7M) | |
| 4. | a) | Find the perimeter of the loop of the curve $3ay^2 = x(x - a)^2$. | (7M) | |
| | b) | By changing the order of integration, evaluate $\int_{0}^{3} \int_{1}^{\sqrt{4-y}} (x+y) dx dy.$ | (7M) | |
| 1 of 2 | | | | |

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

R16

I B. Tech II Semester Regular/Supplementary Examinations, April/May - 2019

FirstRanker.com

Code No: R161203

www.FirstRanker.com www.FirstRanker.com

SET - 3

Max. Marks: 70



Code No: R161203
$$(R16)$$
 $(SET - 3)$ $(7M)$

5. a) Evaluate
$$\int_{0}^{\infty} \frac{x^2}{1+x^4} dx$$
 using β and γ functions. (7M)
b) Show that $\Gamma(m)\Gamma\left(m+\frac{1}{2}\right) = \frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m)$. (7M)

- 6. a) Find the angle between the normal to the surface $x^2 = yz$ at the points (1, 1, 1) (7M) and (2, 4, 1).
 - b) Find the constants a, b, c so that $(x+2y+az)\overline{i} + (bx-3y-z)\overline{j} + (4x+cy+2z)\overline{k}$ (7M) is irrotational. Also find the scalar potential.
- 7. Verify Green's theorem for $\int_C (xy + y^2)dx + (x^2)dy$ where C is the curve bounded (14M) by $y = x^2$ and y = x.

www.firstRanker.com

2 of 2



b) What is the nature of the quadratic form $x^2-3y^2-z^2-zy$? (2M)

R16

- c) Prove that zero is an eigen value of a matrix if and only if it is singular. (2M)
- d) In what direction from the point (1,-2,-1)the directional derivative of (2M) $\phi = x^2 yz + 4xz^2$ is maximum? What is the magnitude of the maximum?
- Show that in an irrotational field, the value of a line integral between two points (2M) e) A and B will be independent of the path of integration and be equal to their potential difference.
- Find the area bounded by the curves $y = x^2$ and x = yf) (2M)
- Show that $\int_{0}^{\infty} x^{n-1} e^{-kx} dx = \frac{\Gamma(n)}{k^{n-1}}$ g)
- PART -B
- a) Verify Cayley-Hamilton theorem for A = 2. [3 1 2 (6M) and find A^{-1} . 2 1 - 3 11 2 1
 - b) Apply Guass Seidel method to solve the equations (8M) 20x + y - 2z = 17. 3x + 20y - z = -182x - 3y + 20z = 25
- 3. a) Find the natural frequencies and normal modes of vibrating system for which the (7M) mass matrix is $\begin{bmatrix} 2 & 0 \\ 0 & 4 \end{bmatrix}$ and stiffness $\mathbf{K} = \begin{bmatrix} 6 & -2 \\ -2 & 9 \end{bmatrix}$.

b) Using Lagrange's reduction, transform
$$x_1^2 + 2x_2^2 - 7x_3^2 - 4x_1x_2 + 8x_1x_3$$
. (7M)

4. a) Trace the curve
$$x^{2/3} + y^{2/3} = a^{2/3}$$
. (7M)

b) By changing the order of integration, evaluate
$$\int_{0}^{a \sqrt{a^{2}-x^{2}}} \sqrt{a^{2}-x^{2}-y^{2}} dy dx.$$
 (7M)

1 of 2

www.FirstRanker.com

www.FirstRanker.com

www.FirstRanker.com



Code No: R161203

SET - 4

Max. Marks: 70

(2M)

(2M)



www.FirstRanker.com

5. a) Show that
$$\Gamma(m)\Gamma\left(m+\frac{1}{2}\right) = \frac{\sqrt{\pi}}{2^{2m-1}}\Gamma(2m)$$
. (7M)
b) Γ_{mmmens} the integral $\int_{0}^{\infty} X^{c}$ is terms of Common function (7M)

- b) Express the integral $\int_{0}^{\infty} \frac{x^{c}}{c^{x}} dx$ in terms of Gamma function.
- 6. a) Find the angle of intersection of the spheres $x^2 + y^2 + z^2 = 39$ and $x^2 + y^2 + z^2 + (7M)$ 4x - 6y - 8z + 52 = 0 at the point (4, -3, 2).
 - b) Prove that $grad(\overline{a}.\overline{b}) = (\overline{b}.\nabla)\overline{a} + (\overline{a}.\nabla)\overline{b} + \overline{b} \times curl\overline{a} + \overline{a} \times curl\overline{b}$. (7M)
- 7. Verify Gauss divergence theorem for $\overline{F} = x^2 \overline{i} + y^2 \overline{j} + z^2 \overline{k}$, over the cube formed (14M) by the planes x = 0, x = a, y = 0, y = b, z = 0, z = c.

www.FirstRanker.com

2 of 2