R18 Regulation *Subject code:* 2B1AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A' Grade)

B.Tech I Semester Supplementary Examinations, April 2022

Mathematics-I

(Common to CE,EEE,ME,ECE,CSE & IT)

Maximum Marks: 70 Date: 30.04.2022 Duration: 3 hours

Note: 1.This question paper contains two parts A and B.
2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
3. Part B consists of 5 Units. Answer any one full question from each unit.
4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)

1 If A,B are invertible matrices of the same order then prove that $(AB)^{-1} = B^{-1} A^{-1}$

2 Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 8 & 7 & 0 & 5 \end{bmatrix}$

3 Find the eigen values of the matrix $\begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$

4 Obtain a quadratic form corresponding to the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 0 & 3 \\ 3 & 3 & 1 \end{bmatrix}$

5 State the theorem on Auxiliary series

6 Write the conditions of the Leibnitz test

7 Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 8 & 7 & 0 & 5 \end{bmatrix}$

8 Define i) Saddle point and ii) Stationary point

9 Evaluate $\int_{y=0}^{1} \int_{x=0}^{2} y \, dx \, dy$

10 Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x \, dz \, dx \, dy$

Part-B

Answer All the following questions. (5X10M =50Marks)

11 Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{bmatrix}$ by Gauss-Jordan method. (10M)

OR

12 Find an LU decomposition of the matrix A and solve the linear system AX=B (10M)

$$\begin{bmatrix} -3 & 12 & -6 \\ 1 & -2 & 2 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -33 \\ 7 \\ -1 \end{bmatrix}$$

13 Show that the matrix satisfies Cayley - Hamilton theorem and also find the value of the Matrix

$$A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 - 2A + I$$

Where A = $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ (10M)

OR

14 Show that the matrix A = $\begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ satisfy Cayley – Hamiltan theorem And hence find A^{-1}, if it exists. (10M)

15 Test the convergence of the series

$$x + \frac{1}{2}\frac{x^3}{3} + \frac{1.3}{2.4}\frac{x^5}{5} + \frac{1.3.5}{2.4.6}\frac{x^7}{7} + \ldots\ldots + \quad (10M)$$

OR

16 Find the nature of the series $\frac{a+x}{1!} + \frac{(a+2x)^2}{2!} + \frac{(a+3x)^3}{3!} + \ldots\ldots\ldots$by Logarithmic test. (10M)

17 Find the extreme values of the function sin x. sin y. sin (x+y) (10M)

OR

18 Find the volume of the greatest rectangular parallelopiped that can be inscribed in the ellipsoid (10M)

19 Change the order of integration and evaluate $\int_o^a \int_{x^2/4a}^{2\sqrt{ax}} xy\, dy\, dx$ (10M)

OR

20 Evaluate $\iiint_v (xy + yz + zx)dx\, dy\, dz$ when 'V' is the region of Sphere bounded by x = 0, x = 1, y = 0, y = 2, z = 0, z = 3 (10M)