~~R18 Regulation~~ *Subject code:* 2B1AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech I Year I Semester Examinations, December 2019

MATHEMATICS-I

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

Maximum Marks: 70 Date: 16.12.2019 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 Define the rank of a matrix

2 If $A = \begin{bmatrix} 2 & 3 \\ 5 & -7 \end{bmatrix}$, verify that $(A^2)^T = (A^T)^2$

3 Define orthogonal matrix

4 Determine the nature, index and signature of the quadratic form $x^2 - 6xy + y^2$

5 State Raabe`s test

6 Test the convergence of the series $\sum_{n=1}^{\infty} \frac{n^2}{n!}$

7 If $u = e^x siny,\ v = e^x cosy$ then find Jacobian $\frac{\partial(u,v)}{\partial(x,y)}$

8 Find $\frac{du}{dt}$ if $u = \frac{x}{y}$ where $x = e^t, y = logt$

9 Evaluate $\int_0^2 \int_0^x ydydx$

10 Find the limits by change the order of integral $\int_0^{\infty} \int_x^{\infty} \frac{e^{-y}}{y} dydx$

Part-B

Answer All the following questions. (10M X 5=50Marks)

11 a) Find the rank of the matrix by reducing to Echelon form where

$$\begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 5 \\ -1 & -2 & 6 & 7 \end{bmatrix}$$ 6M

b) For which value of `α` the rank of a matrix $A=\begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ \alpha & 13 & 10 \end{bmatrix}$ is 2 4M

OR

12 a) Investigate for what values ` k` the equations $x+y+z=1$, $2x+y+4z=k$, $4x+y+10z=k2$ have infinite number of solutions 6M

b) Solve $2x-y+3z=0, 3x+2y+z=0, x-4y+5z=0$ 4M

13 Verify Cayley -Hamilton theorem for $A=\begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ and find A^{-1} and A^4 10M

OR

14 Diagonalize the matrix by an orthogonal reduction where $A=\begin{bmatrix} 7 & 4 & -4 \\ 4 & -8 & -1 \\ -4 & -1 & -8 \end{bmatrix}$ 10M

15 Test the convergence of the series $x+\frac{2^2}{2!}x^2+\frac{3^3}{3!}x^3+\cdots$ 10M

OR

16 a) Test the convergence of the series $\sum_{n=1}^{\infty}\frac{4.7.10....(3n+1)}{n!}x^n$ 6M

b) Test the convergence of the series $\sum_{n=1}^{\infty}\frac{(1+nx)^n}{n^n}$ 4M

17 Find the extreme values of $u(x,y)=x^3+3xy^2-15x^2-15y^2+72x$ 10M

OR

18 Find the three numbers x, y, z such that whose product is maximum when $x^2+y^2+z^2=9$ 10M

19 Evaluate by *changing the order of* $\int_0^1 \int_{x^2}^{2-x} (x+y)dxdy$ 10M

OR

20 Evaluate $\iint (x+y)^2 dxdy$ over the area bounded by ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ 10M