R17 Regulation *Subject: 1B1AB*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech. I Year I Semester Supplementary Examinations, January 2024

MATHEMATICS-II

(Common to Civil Engineering & Mechanical Engineering)

Maximum Marks: 70 Date: 20.01.2024 Duration: 3hours

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. Show that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$
2. Find the value of $\beta(2,3)$
3. Compute the value of $\int_0^{\pi/2}\int_0^{sin\theta} r dr d\theta$
4. Evaluate $\int_0^1\int_1^2 (x+y) dy dx$
5. Find $grad\ \phi$ at (1,0,2) where $\phi = x^2y + 2xz^2 - 8$
6. What is the value of $div\ \vec{r}$?
7. If $\nabla\emptyset = x\vec{i} + y\vec{j} + z\vec{k}$, find the scalar potential
8. State Stoke's theorem
9. Find Laplace transform of Sin2t.
10. Find $L^{-1}\left[\frac{1}{(s+1)^2}\right]$

Part-B

Answer all the questions (5X10M=50M)

11. Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ (10 Marks)

(OR)

12. Evaluate $\int_0^\infty e^{-ax}x^{m-1}sinbx\ dx$ in terms of Gamma function. (10 Marks)

13. Using triple integration, find the volume of the sphere $x^2 + y^2 + z^2 = a^2$ (10 Marks)

(OR)

14. Change the order of integration and evaluate $\int_0^1 \int_0^x dydx$ (10 Marks)

15. Show that $\nabla \times (\nabla \times \vec{F}) = \nabla(\nabla \cdot \vec{F}) - \nabla^2\vec{F}$ (10 Marks)

(OR)

16. (a) Find the value of the constants a, b, c so that the vector (5 Marks)

$\vec{F} = (x + 2y + az)\vec{\imath} + (bx - 3y - z)\vec{\jmath} + (4x + cy + 2z)\vec{k}$ is irrotational.

(b) Find the value of 'a' so that the vector $\vec{F} = (x + 3y)\vec{\imath} + (y - 2z)\vec{\jmath} + (x + az)\vec{k}$ is Solenoidal. (5 Marks)

17. Evaluate $\int_C (xy + x^2)dx + (x^2 + y^2)dy$, where C is the square bounded by the lines x=-1,x=1,y=-1,y=1 using Green's theorem. (10 Marks)

(OR)

18. Use divergence theorem to evaluate $\vec{F} = 4x\vec{\imath} - 2y^2\vec{\jmath} + z^2\vec{k}$ and S is the surface bounded the region x^2+y^2=4, z=0 and z=3. (10 Marks)

19. (a) Evaluate $L^{-1}\left[\frac{1}{s^2+6s+13}\right]$. (5 Marks)

(b) Find the Laplace transform of $f(t) = \frac{1-e^{-t}}{t}$. (5 Marks)

(OR)

20. Solve the differential equation $\frac{d^2y}{dt^2} - 3\frac{dy}{dt} + 2y = e^{2t}$ with y(0) = -3 and $y'(0) = 5$ using Laplace transform. (10 Marks)