



R17 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY  
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject: 1B1AB

B.Tech. I Year I Semester Supplementary Examinations, September 2023

## MATHEMATICS-II

(Common to Civil Engineering & Mechanical Engineering)

Maximum Marks: 70

Date: 30.09.2023 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. 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  $\text{grad } \phi$  at  $(1,0,2)$  where  $\phi = x^2y + 2xz^2 - 8$
6. What is the value of  $\text{div } \vec{r}$ ?
7. If  $\nabla\phi = x\vec{i} + y\vec{j} + z\vec{k}$ , find the scalar potential
8. State Stoke's theorem
9. Find Laplace transform of  $\text{Sin}2t$ .
10. Find  $L^{-1}\left[\frac{1}{(s+1)^2}\right]$

### Part-B

Answer all the questions

(10M X 5=50M)

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

(10 Marks)

(OR)

12. Evaluate  $\int_0^{\infty} e^{-ax} x^{m-1} \sin bx dx$  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  $\int_0^1 \int_0^x dy dx$  (10 Marks)

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

(OR)

16. Find the value of 'a' so that the vector  $\vec{F} = (x + 3y)\vec{i} + (y - 2z)\vec{j} + (x + az)\vec{k}$  is Solenoidal. (10 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  $\vec{F} = 4x\vec{i} - 2y^2\vec{j} + z^2\vec{k}$  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)