



R17 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

Subject Code: 1B2AG

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

## Mathematics-II

(Common to EEE, ECE, CSE & IT)

Maximum Marks: 70

Date: 16.09.2023 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. Write the relation between Beta and Gamma function.
2. Evaluate  $\int_0^1 x^5 (1-x)^3 dx$
3. Evaluate  $\int_0^2 \int_0^x e^{x+y} dx dy$
4. Find  $\int_R x^2 dx dy$  over the region bounded by hyperbola  $xy=4$ ;  $y=0$ ;  $x=1$ ;  $x=4$
5. Write the physical interpretation of  $\nabla\phi$
6. Prove that  $\text{curl grad } \phi = 0$
7. State Gauss divergence theorem
8. If  $F = 3xy\bar{i} - y^2\bar{j}$ , then find  $\int_C \bar{F} \cdot d\bar{r}$ . where C is the curve  $y=2x^2$  in the XY - plane from (0,0) to (1,2)
9. State second shifting theorem.
10. Find  $L(e^{3t} \cdot \sin 2t)$

### Part-B

Answer all the Questions

5x10M=50 Marks

11. Prove that  $\Gamma(n)\Gamma(1-n) = \frac{\pi}{\sin n\pi}$  [10M]

(OR)

12. Prove that  $B(m,n) = \frac{\Gamma m \Gamma n}{\Gamma(m+n)}$  [10]

13. Evaluate  $\iiint_R dx dy dz$  where 'R' is the finite region of space formed by the planes  $x=0, y=0, z=0$  and  $2x + 3y + 4z = 12$ . [10]

(OR)

14. Find the volume of the ellipsoid  $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$  [10]

15. If  $F = y(ax^2 + z) i + x(y^2 - z^2) j + 2xy(z - xy) k$  is solenoidal then find a. [10]

(OR)

16.(a) Prove that  $r^n \bar{r}$  is solenoidal if  $n = -3$  [5]

(b) If  $\bar{f} = x^2 y \bar{i} - 2xz \bar{j} + 2yz \bar{k}$  find  $\text{curl}(\text{curl} \bar{f})$  [5]

17. If  $F = 4xz \bar{i} - y^2 \bar{j} + yz \bar{k}$  evaluate  $\iint_S \bar{F} \cdot \bar{n} ds$  where S is the surface of the cube bounded by  $x=0, x=a, y=0, y=a, z=0, z=a$ . [10]

(OR)

18. Verify Green's theorem for  $\int_c (3x^2 - 8y^2) dx + (4y - 6xy) dy$  where 'c' is the region bounded by  $x=0, y=0,$  and  $x+y=1$ . [10]

19. Find the Laplace transform of the rectified semi-wave function defined by [10]

$$F(f) = \begin{cases} \sin \omega t & 0 < t < \pi/\omega \\ 0 & \pi/\omega < t < 2\pi/\omega \end{cases}$$

(OR)

20.(a) Find  $L^{-1} \left[ \frac{1}{s^2(s^2+1)} \right]$  [5]

(b) Using Laplace transform, solve  $(D^2 + 4D + 5) y = 5$ , given that  $y(0) = 0, y'(0) = 0$  [5]