*R20 Regulation* *Subject code: 3B2AA*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

## B.Tech II Semester Supplementary Examinations, June 2024

## ORDINARY DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

**(Common to CE,CSE, CSE(AI&ML), CSE(DS) & IT)**

*Maximum Marks: 70* Date:24.06.2024 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. Each question carries 10 marks in PartB and may have a, b, c, d as sub questions.**

Part-A

| All the following questions carry equal marks (10X2M=20 Marks) | | CO | Bloom Tx |
|---|---|---|---|
| 1 | Define Integrating factor. | 1 | L1 |
| 2 | State Law of natural growth and decay. | 1 | L1 |
| 3 | Solve $(D^2 - 3D + 4)\, y = 0$ | 2 | L1 |
| 4 | Find the wronskin of the differential equation $(D^2 + 4)\, y = 0$ | 2 | L1 |
| 5 | Transform the differential equation $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y=0$ with constant coefficients. | 3 | L1 |
| 6 | Write the standard form of Cauchy's Homogeneous Liner Equation | 3 | L1 |
| 7 | Find the greatest value of the directional derivative of the function $f = x^2 y z^3$ at (2,1,-1) | 4 | L1 |
| 8 | If $\bar{f} = (x+3y)\,\bar{\imath} + (y-2z)\,\bar{\jmath} + (x+pz)\,\bar{k}$ is solenoidal then find P | 4 | L1 |
| 9 | State stoke's theorem. | 5 | L1 |
| 10 | What is the Statement of Gauss Divergence Theorem | 5 | L1 |

Part-B

| Answer All the following questions. (5X10M=50Marks) | | | |
|---|---|---|---|
| 11 | A. Solve $\frac{dy}{dx} + x\sin 2y = x^3 cos^2 y$ (5M)<br>B. Solve $2xydy - (x^2 + y^2 + 1)dx = 0$ (5M) | 1 | L2 |
| | OR | | |
| 12 | A Bacterial culture, growing exponentially, increases from 100 to 400 grams in 10 hours. How much was present after 3 hours. (10M) | 1 | L2 |
| 13 | Solve$(D^2 + 1)x = t\cos 2t$ (10M) | 2 | L2 |
| | OR | | |
| 14 | Solve $D^2(D^2 + 4)y = 96x^2 + sin2x - k$ (10M) | 2 | L2 |

| | | | |
|---|---|---|---|
| 15 | Solve $(x+1)^2\frac{d^2y}{dx^2} - 3(x+1)\frac{dy}{dx} + 4y = x^2 + x + 1$ (10M) | 3 | L2 |
| | OR | | |
| 16 | Solve $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = x^2 + \frac{1}{x^2}$ (10M) | 3 | L2 |
| 17 | Prove that the vector $(x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$ is irrotational and find its scalar potential. (10M) | 4 | L2 |
| | OR | | |
| 18 | A. Find the values of a and b so that the surface $ax^2 - byz = (a+2)x$ will be orthogonal to the surface $4x^2y + z^2 = 4$ at the point (-1,1,2) (5M)<br>B. Prove that curl $(\bar{a} \times \bar{b}) = \bar{a}$ div $\bar{b} - \bar{b}$ div $\bar{a} + (\bar{b}.\nabla)\bar{a} - (\bar{a}.\nabla)\bar{b}$ (5M) | 4 | L2 |
| 19 | Verify stokes theorem for $F = y^2 i + y j - 3 x k$ and S is the upper half of the sphere $x^2 + y^2 + z^2 = a^2$ and $z \geq 0$. (10M) | 5 | L2 |
| | OR | | |
| 20 | Verify Green's Theorem for (10M)<br>$\int_c [(xy + y^2)\,dx + x^2\,dy]$, where c is bounded by $y = x$ and $y = x^2$ | 5 | L2 |