



R20 Regulation

Subject code:3B2AA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Supplementary Examinations, July 2025

ORDINARY DIFFERENTIAL EQUATIONS & VECTOR CALCULUS
(Common to CE, CSE, CSE(AI&ML), CSE(DS) & IT)

Maximum Marks: 70

Date: 09.07.2025

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)		Marks	CO	BTL
1	Find I. F. of $2xydy - (x^2 + y^2 + 1)dx = 0$	2M	1	L1
2	State Law of natural growth and decay.	2M	1	L1
3	Solve $(D^2 - 3D + 4)y = 0$	2M	2	L1
4	Find the wronskin of the differential equation $(D^2 + 4)y = 0$	2M	2	L1
5	Transform the differential equation $x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = 0$ with constant coefficients.	2M	3	L1
6	Find $L^{-1}\left\{\frac{1}{s^2+2s+5}\right\}$	2M	3	L1
7	Prove that $div \vec{r} = 3$	2M	4	L1
8	Define curl of a vector point function.	2M	4	L1
9	State Gauss divergence theorem.	2M	5	L1
10	State Greens theorem in a plane.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Prove that the system of confocal conics $\frac{x^2}{a} + \frac{y^2}{a-b} = 1$, is self orthogonal. Here a is the parameter and b is the constant.	10M	1	L2
OR				
12	A murder victim is discovered and a lieutenant from the forensic science laboratory is summoned to estimate the time of death. The body is located in a room that is kept at a constant temperature of 68°F . the lieutenant arrived at 9:40P.M and measured the body temperature as 94.4°F at that time. Another measurement of the body temperature at 11 P.M is 89.2°F . Find the estimated time of death.	10M	1	L2
13	Solve $(D^2 + 1)x = t \cos 2t$	10M	2	L2
OR				

14	Solve $D^2(D^2 + 4)y = 96x^2 + \sin 2x - k$	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 $(x^3D^3 + 3x^2D^2 + xD + 8)y = 65\cos(\log x)$	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) Prove that if \vec{r} is the position vector of any point in space, then $r^n \cdot \vec{r}$ is irrotational b) Find the angle between the surface $xy^2z = 3x+z^2$ and $3x^2 - y^2 + 2z = 1$ at $(1, -2, 1)$	5M 5M	4	L2
19	Verify Stokes theorem for $F = y^2 i + y j - z x k$ 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 $\int_c [(xy + y^2) dx + x^2 dy]$, where c is bounded by $y = x$ and $y = x^2$	10M	5	L2