R25 Regulation *Subject code:5BS2AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Regular Examinations, June 2026

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

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

Maximum Marks: 60 Date:15.06.2026 Duration: 3 hours

Note: **1.This question paper contains two parts A and B.**
2. Part A is compulsory which carries 10 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 (5X2M=10Marks)		Marks	CO	BTL
1.a	State Newton's Law of Cooling.	2M	1	L1
b	Find the particular integral value of $(D^2 - 4D + 13)y = e^{2x}$.	2M	2	L3
c	Find the Laplace transform of $cos^2 2t$.	2M	3	L2
d	If $\bar{f} = 3x^2\bar{\imath} + \bar{\jmath} + 2z\,\bar{k}$ then find div $\bar{f}$ at (1,-1,1).	2M	4	L2
e	If a force $\bar{F} = 2x^2y\bar{\imath} + 3xy\bar{\jmath}$ displaces a particle in the xy −plane from (0, 0) to (1, 4) along a curve $y = 4x^2$. Find the work done.	2M	5	L3

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
2	a) A body kept in air with the temperature 25^0C cools from 140^0C to 80^0C in 20 minutes. Find when the body cools down to 35^0C.	5M	1	L3
	b) Evaluate $\frac{dy}{dx} + y\,tany = y^2 secx$.	5M	1	L3
	OR			
3	Show that the system of confocal conics $\frac{x^2}{(a^2+\lambda)} + \frac{y^2}{(b^2+\lambda)} = 1$, where λ is a parameter, is self orthogonal.	10M	1	L2
4	Solve the equation $(D^2 - 2D + 2)y = e^x tanx$.	10M	2	L3
	OR			
5	Solve the differential equation $(D^2 + 4)y = sec2x$ by the method of variation of parameters.	10M	2	L3
6	a) Find the Laplace transform of $\frac{\cos at - \cos bt}{t}$.	5M	3	L3
	b) Evaluate $L\left(\int_0^t e^{-2t} tsint\,dt\right)$	5M	3	L4
	OR			

7	Find inverse Laplace transform of the function $\frac{s^2}{(s^2+a^2)^2}$ using convolution theorem.	10M	3	L3
8	a) If $\bar{r} = x\bar{\imath} + y\bar{\jmath} + z\bar{k}$, prove that $div\bar{r} = 3$ and $curl\bar{r} = 0$. b) Find the directional derivative of $\emptyset = 2xy + z^2$ at $(1, -1, 3)$ in the direction of a vector $\bar{\imath} + 2\bar{\jmath} + 3\bar{k}$.	5M 5M	4 4	L3 L3
	OR			
9	a) Suppose a vector field is given by $\bar{F} = (x^2 - y^2 + x)\bar{\imath} - (2xy + y)\bar{\jmath}$. Is this field irrotational? If so, find its scalar potential. b) Show that $\bar{V}(x, y, z) = 2xyz\bar{\imath} + (x^2z + 2y)\bar{\jmath} + x^2y\bar{k}$ is irrotational and find a scalar function $u(x, y, z)$ such that $\bar{V} = grad(u)$.	5M 5M	4 4	L3 L3
10	Verify Green's theorem in plane for $\int_C (3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy$, where C is the region bounded by the parabolas $y^2 = x$ and $x^2 = y$.	10M	5	L3
	OR			
11	State and verify Gauss divergence theorem for $\bar{F} = (x^3 - yz)\bar{\imath} - 2x^2y\bar{\jmath} + z\bar{k}$ taken over the surface of the cube bounded by the planes $x = y = z = a$ and coordinate planes.	10M	5	L3