R20 Regulation *Subject code:3B2AI*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B. Tech II Semester Supplementary Examinations, June 2026

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS (ME)

Maximum Marks: 70 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 (10X2M=20 Marks)		Marks	CO	BTL
1	Define Linear differential equation.	2M	1	L1
2	Check whether the differential equation $(x^2 + 2xy)\,dx + (y^2 + x^2)\,dy=0$ is exact or not.	2M	1	L1
3	Solve $(D^2 + 9)\,y = 0$.	2M	2	L1
4	Write P.I of $f(D)\,y = Q(x)$ where $Q(x) = \sin bx$ (or) $\cos bx$, where 'b' is a constant.	2M	2	L1
5	Form the PDE from $z = a + b(x+y)$	2M	3	L1
6	Form the PDE by eliminating the arbitrary functions from $z = f(x^2+y^2)$	2M	3	L1
7	Find a unit normal vector to the given surface $x^2y + 2xz = 4$ at the point (2,-2,3).	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	Solve $2\frac{dy}{dx} - y\sec x = y^3 \tan x$	10M	1	L2
	OR			
12	An object whose temperature is 75^0c cools in an atmosphere of constant temperature 25^0c at the rate $k\theta$, θ being the excess temperature of the body over the temperature ,if after 10 minutes the temperature of the object falls to 65^0c,find its temperature after 20 minutes, find the time required to cool down to 55^0c.	10M	1	L2
13	Solve by the method of variation of parameters $(D^2 + a^2)y = tanax$.	10M	2	L2
	OR			
14	Solve$(D^3 + 2D^2 + D)y = e^{2x} + x^2 + x + \sin 2x$	10M	2	L2

15	Form a PDE by eliminating the arbitrary functions $z = f(x) + e^{y} g(x)$ Solve $p \tan x + q \tan y = \tan z$	10M	3	L2
	OR			
16	Solve (i) $p^2 + q^2 = n\,p\,q$ (ii) $p - x^2 = q + y^2$	5M 5M	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	Find the directional derivative of the function $xy^2 + yz^2 + zx^2$ along the tangent to the curve $x = t, y = t^2, z = t^3$ at the point (1,1,1).	10M	4	L2
19	Use Greens 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.	10M	5	L2
	OR			
20	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