R20 Regulation *Subject code:3B2AA*

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B. Tech II Semester Supplementary Examinations, January 2026

ORDINARY DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

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

Maximum Marks: 70 Date: 08.01.2026 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	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 P.I. of $(D^2 + 9)y = cos3x$	2M	2	L1
5	Define Cauchy's linear equation.	2M	3	L1
6	Write standard form of Legendre's equation.	2M	3	L1
7	Prove that $div\, \bar{r} = 3$	2M	4	L1
8	Define curl of a vector point function.	2M	4	L1
9	Evaluate $\int_C \bar{F}.d\bar{r}$ where $\bar{F} = x^2\bar{\imath} + y^2\bar{\jmath}$ and C is the curve $y = x^2$ in the xy - plane from (0,0) to (1,1)	2M	5	L1
10	What is the Statement of Stokes theorem	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 68^0F. the lieutenant arrived at 9:40P.M and measured the body temperature as 94.4^0F at that time. Another measurement of the body temperature at 11 P.M is 89.2^0F. Find the estimated time of death.	10M	1	L2
13	Solve$(D^2 + 1)x = tcos2t$	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$(x^3D^3 + 3x^2D^2 + xD + 8)y = 65\cos(\log x)$	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 $\bar{r}$ is the position vector of any point in space, then $r^n.\bar{r}$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 $F = y^2\,I + y\,j - 3\,x\,k$ 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	Solve $(x+1)^2\frac{d^2y}{dx^2} - 3(x+1)\frac{dy}{dx} + 4y = x^2 + x + 1$	10M	5	L2

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