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 2024

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

(Mechanical Engineering)

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. 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)		CO	Bloom Tx
1	Write the condition for exact differential equation.	1	L1
2	State the Law of natural growth and decay.	1	L1
3	Solve $(D^3+3D^2+3D+1)y = 0$	2	L1
4	Find the P.I. of $(D^2 + 9)y = cos3x$	2	L1
5	Form the PDE from $z = a + b(x+y)$	3	L1
6	Solve $p^2 + q^2 = m^2$	3	L1
7	Prove that $div\ \bar{r} = 3$	4	L1
8	Find ∇A at (2,-1,2) if $A = 3xyz^2\bar{\imath} + 2xy^3\,\bar{\jmath} - x^2yz\,\bar{k}$	4	L1
9	If $\bar{F} = (4xy - 3x^2z^2)\bar{\imath} + 2x^2\bar{\jmath} - 2x^3z\bar{k}$, then find grad f	5	L1
10	What is the Statement of Stokes theorem	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	A. Write the working rule of orthogonal trajectories in cartesian co-ordinates. (5M) B. Find the Orthogonal Trajectories of the family of curves $x^2 + y^2 = a^2$ (5M)	1	L2
	OR		
12	Solve $\frac{dy}{dx} + x\sin 2y = x^3cos^2y$ (10M)	1	L2
13	Solve by the method of variation of parameter $(D^2 - 2D)y = e^x\sin x$ (10M)	2	L2
	OR		
14	Solve$(D^3 + 2D^2 + D)y = e^{2x} + x^2 + x + \sin 2x$ (10M)	2	L2
15	Solve $(y-z)p + (z-x)q = x-y$ (10M)	3	L2

	OR		
16	Solve $z = p^2 + q^2$ (10M)	3	L2
17	A. Find a unit normal vector to the surface $z = x^2 + y^2$ at (-1,-2,5) (5M) B. Find Div $\bar{f}$ at (1,-1,1), If $\bar{f} = xy^2i + 2x^2yzj - 3yz^2k$ (5M)	4	L2
	OR		
18	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) (10M)	4	L2
19	If $\bar{F} = 4xz\bar{\imath} - y^2\bar{\jmath} + yz\bar{k}$, evaluate $\int \bar{F}.\bar{n}\ ds$ where S is the surface of the cube bounded by $x = 0, x = a, y = 0, y = a, z = 0, z = a$ (10M)	5	L2
	OR		
20	Verify greens theorem in the plane for $\int_c (x^2 - xy^3)\,dx + (y^2\text{-}2xy)\,dy$ where c is a square with vertices (0,0) ,(2,0) ,(2,2) ,(0,2) (10M)	5	L2