



R20 Regulation

Subject code:3B2AE

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Supplementary Examinations, July 2025

**ORDINARY DIFFERENTIAL EQUATIONS, TRANSFORMS AND VECTOR CALCULUS
(EEE)**

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	Define Integrating factor.	2M	1	L1
2	Find I. F. of $2xydy - (x^2 + y^2 + 1)dx = 0$.	2M	1	L1
3	Find General solution of $(D^3 + 2D^2 + D)y = 0$.	2M	2	L1
4	Find P.I of $(D^2+6D+9)Y = 2e^{-3x}$.	2M	2	L1
5	State and prove first shifting theorem.	2M	3	L1
6	Find L $\{e^{-t}(3\cos 5t - 4\sin 5t)\}$.	2M	3	L1
7	Define gradient of a scalar point function.	2M	4	L1
8	If $\vec{f} = (x^2y)\vec{i} + (2y^2z)\vec{j} + (3z^2y)\vec{k}$ then find curl \vec{f} .	2M	4	L1
9	State Stoke's theorem.	2M	5	L1
10	Define surface integral.	2M	5	L1

Part-B

Answer All the following questions. (5X10M=50Marks)		Marks	CO	BTL
11	Solve $3\frac{dy}{dx} - y\cos x = y^4(\sin 2x - \cos x)$.	10M	1	L2
OR				
12	An object whose temperature is $75^{\circ}C$ cools in an atmosphere of constant temperature $25^{\circ}C$ 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 $65^{\circ}C$, find its temperature after 20 minutes, find the time required to cool down to $55^{\circ}C$.	10M	1	L2
13	Solve $(D^2 - 4D)y = x^2\sin 2x$.	10M	2	L2
OR				
14	Solve by the method of variation of parameters $(D^2 + a^2)y = \sec ax$.	10M	2	L2
15	Using Laplace transform evaluate, $\int_0^{\infty} \frac{\cos at - \cos bt}{t} dt$.	10M	3	L2
OR				
16	Solve the D.E $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 12y = e^{3x}$ given that $y(0) = 0$ and $y'(0) = 0$.	10M	3	L2

17	Prove that if \vec{r} is the position vector of any point in space, then $r^n \vec{r}$ is irrotational.	10M	4	L2
OR				
18	Prove that $\nabla \times (\nabla \times \vec{a}) = \nabla(\nabla \cdot \vec{a}) - \nabla^2 \vec{a}$.	10M	4	L2
19	Verify stokes theorem for $F = y^2 \vec{i} + y \vec{j} - 3x \vec{k}$ 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	Find the work done by $\vec{f} = 3x^2 \vec{i} + \vec{j} + 2z \vec{k}$ along the straight line from (0,0,0) to (2,1,3).	10M	5	L2