



R20 Regulation

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY
(Autonomous, Accredited by NAAC with 'A' Grade)

Subject code: 3B2AE

B.Tech II Semester Regular Examinations, September 2021

ORDINARY DIFFERENTIAL EQUATIONS, TRANSFORMS & VECTOR CALCULUS
(EEE)

Maximum Marks: 70

Date:09.09.2021 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)

- 1 Solve $y dx - x dy = a(x^2 + y^2) dx$
- 2 Solve the following differential equation $(2y - x^3) dx + x dy = 0$.
- 3 Find the solution of the differential equation $(D^2 + 4)y = 0$
- 4 Find the particular integral of $(D^2 + 5D + 6)y = e^x$
- 5 Define Laplace Transform.
- 6 Find $L\{t \cos t\}$
- 7 If $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$ then find $\text{div } \vec{r}$.
- 8 If $\vec{F} = x\vec{i} + xy\vec{j} + zx\vec{k}$, Evaluate $\text{curl } \vec{F}$
- 9 State Gauss divergence theorem,
- 10 State Stokes theorem.

Part-B

Answer All the following questions.

(5X10M=50Marks)

- 11 a) Solve $(1 + e^{x/y}) dx + (1 - \frac{x}{y}) e^{x/y} dy = 0$
b) Solve the differential equation $(y - x^2) dx + (x^2 \cot y - x) dy = 0$ (5M+5M)
OR
- 12 The number N of bacteria in a culture grew at a rate proportional to N. The value of N was initially 100 and increased to 332 in one hour. What would be the value of N after $1\frac{1}{2}$ hours? (10M)
- 13 a) Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = xe^{3x} + \sin 2x$
b) Solve $(D^3 + 1)y = \cos 2x$ (5M+5M)
OR
- 14 Solve $(D^2 + 4)y = \tan 2x$ by variation of parameters (10M)

15 a) Find $L\left[\frac{\cos 4t \sin 2t}{t}\right]$

b) Find the Laplace transforms of $\frac{s}{(s^2+a^2)(s^2+b^2)}$ using convolution theorem (5M+5M)

OR

16 a) Find $L^{-1}\left\{\frac{s-5}{s^2+3s+2}\right\}$

b) Solve the initial value problem $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 4y = f(x)$, with $y(x)$ and $\frac{dy}{dx}$ vanish at $x=0$ and $f(x) = 2e^{-2x}$ using Laplace transforms. (5M+5M)

17 a) Prove that $\text{div}(r^n \bar{r}) = (n+3)r^n$, where $r^2 = x^2 + y^2 + z^2$.

b) Find $\text{curl } \bar{f}$ at the point (1,2,3), given that $\bar{f} = \text{grad}(x^3y + y^3z + z^3 - x^2y^2z^2)$. (5M+5M)

OR

18 Find constants a, b and c if the vector $\bar{f} = (2x + 3y + az)\bar{i} + (bx + 2y + 3z)\bar{j} + (2x + cy + 3z)\bar{k}$ is irrotational. (10M)

19 Evaluate $\oint \bar{f} \cdot d\bar{r}$ where $\bar{f} = (x^2 + y^2)\bar{i} + (x^2 - y^2)\bar{j}$ and c is the curve $y = x^2$ in the xy plane joining (0,0) and (1,1) (10M)

OR

20 a) Calculate the work done by force $F = 3xy\bar{i} - y^2\bar{j}$ in moving a particle in xy-plane from (0,1) to (1,2) along parabola $y = x^2$.
 b) Apply Stoke's theorem to evaluate $\oint (x+y)dx + (2x-z)dy + (y+z)dz$, where c is the boundary of the triangle with vertices (2,0,0), (0,3,0) and (0,0,6). (5M+5M)