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*R18 Regulation* *Subject code: 2B2AA*

# TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

**B.Tech II Semester Supplementary Examinations, October 2022**

## Engineering Mathematics– II

**(Common to CE,EEE,ME,ECE,CSE & IT)**

***Maximum Marks: 70*** Date:11.10.2022 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 which carries 10M.
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 $y(2xy+e^x)dx = e^x dy$.

2 Define Trajectories.

3 Solve $\frac{d^3y}{dx^3} - 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} - 6y = 0$.

4 Find the P.I. of $(D^2+1)y = \sin x$.

5 Does the Laplace transform of $\frac{\cos at}{t}$ exist? Justify.

6 State initial and final value theorem.

7 If $\nabla\phi = yz\,\vec{i} + xz\,\vec{j} + xy\,\vec{k}$, then find $\phi$.

8 What is the greatest rate of increase of $\phi = xyz^2$ at (1, 0, 3).

9 If $\vec{F} = x^2\,\vec{i} + xy\,\vec{j}$, evaluate $\int_C \vec{F}.d\vec{r}$ along the straight line $y=x$ from (0, 0) to (1, 1).

10 Define conservative field.

Part-B

Answer All the following questions. (5X10M=50Marks)

11 A. Solve $(x^2+y^2)(xdx+ydy) = xdy - ydx$. (5M)

B. Find the orthogonal trajectories of cardioids $r = a(1-\cos\theta)$, where $a$ being parameter. (5M)

OR

12 A. Solve $(x^2 - 2x + 2y^2)dx + 2xydy = 0$. (5M)

B. Solve $\frac{dy}{dx} - 2y\tan x = y^2\tan^2 x$. (5M)

13 Solve the equation $(x^2D^2 - xD + 4)y = x^2\sin(\log x)$. (10M)

OR

14 Solve by the method of variation of parameters $\frac{d^2y}{dx^2} + 4y = \sec 2x$. (10M)

15 Solve the differential equation $y''+9y=\cos 2t, y(0)=1, y\left(\frac{\pi}{2}\right)=-1$ using Laplace transform. (10M)

OR

16 Using Convolution theorem, find the inverse Laplace transform of $\frac{s}{(s^2+a^2)^2}$. (10M)

17 A. Prove that $div\, grad\, r^n = n(n+1)r^{n-2}$. (5M)

B. Find the directional derivative of $Q = 2xy + z^2$ at the point (1, -1, 3) in the direction of $\vec{r} = \vec{i} + 2\vec{j} + 2\vec{k}$. (5M)

OR

18 A. Find $a$ and $b$ such that the surfaces $ax^3 - by^2z = (a+3)x^2, 4x^2y - z^3 = 11$ cuts orthogonally at (2, -1, -3). (5M)

B. Prove that $\vec{F} = (y^2 + 2xz^2)\vec{i} + (2xy - z)\vec{j} + (2x^2z - y + 2z)\vec{k}$ is irrotational and hence find its scalar potential. (5M)

19 Verify Gauss divergence theorem for $\vec{F} = x^2\vec{i} + y^2\vec{j} + z^2\vec{k}$, where S is the surface of the cuboid formed by the planes $x=0, x=a, y=0, y=b, z=0$ and $z=c$. (10M)

OR

20 A. Using Green's theorem in a plane, evaluate $\int_C [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$, where C is the boundary of the region enclosed by $y=\sqrt{x}$ and $y=x^2$. (5M)

B. Verify Stoke's theorem for $\vec{F} = (x^2 - y^2)\vec{i} + 2xy\vec{j}$ in the rectangular region above -the XY plane bounded by the lines $x=0, x=a, y=0$ and $y=b$. (5M)