R20 Regulation *Subject code:* 3B2AI

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

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

B.Tech II Semester Regular Examinations, September 2021

DIFFERENTIAL EQUATIONS & VECTOR CALCULUS

(ME)

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 *Find an* Integrating factor of $\frac{dy}{dx}+\frac{2}{x}y=\sin x$

2 Solve $\frac{dy}{dx}=xe^{x-y}$

3 *Find the Complementary function of* $(D^3-6D^2+11D-6)y=e^{-2x}+e^{3x}$

4 *Find the Particular Integral of* $(D^2-3D+2)y=e^{2x}$

5 *Form Partial differential equation by* eliminating the arbitrary constants
$z=ax+by+ab$

6 *Form Partial differential equation by* eliminating the arbitrary function
$z=f\left(\frac{y}{x}\right)$

7 *Find* $\nabla(x^2+yz)$

8 *Define an Irrotational Vector*

9 *State Stokes*'s theorem

10 *Evaluate* $\int_c f.dr$ *where* $f=x^2i+y^2j$ *where* $'c'$ *is the line* $y=x$ *in the* $xy-$ *plane from* $(0,0)$ *to* $(1,1)$

Part-B

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

11 (a) *Solve* $ydx-xdy+3x^2y^2e^{x^3}dx=0$ 5M

(b) *Solve* $\frac{dy}{dx}+y\tan x=y^2\sec x$ 5M

OR

12 (a) *Showthat* $y^2=4a(x+a)$ *is self – orthogonal system* 5M

(b) If the air is maintained at 30^oC *and* the temperature of body cools from 80^oC *to* 60^oC *in* 12 min., *find* the temperature of body *after* 24 minutes 5M

13 (a) Solve $(D^2+4)y = \text{Sin}\,2x$ 5M

(b) Solve $(D^2-2D+1)y = xe^x \sin x$ 5M

OR

14 Solve $(D^2+4)y = \tan 2x$ by using the method of variation of parameters 10M

15 (a) Form Partial differential equation by eliminating the arbitrary function

$z = f(z-xy, x^2+y^2)$ 5M

(b) Solve $yzp - xzq = xy$ 5M

OR

16 (a) Solve $p^2 - q^2 = x - y$ 5M

(b) Solve $(y-z)p + (x-y)q = z - x$ 5M

17 (a) Find the directional derivative of $\phi = x^2yz + 4xz^2$ at $(1,-2,-1)$ in the direction of $2i - j - 2k$ 5M

(b) Prove that $\nabla^2(r^n) = n(n+1)r^{n-2}$ 5M

OR

18 (a) Show that the vector $(x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$ is irrotational vector and find its scalar potential function. 6M

(b) Show that Curl grad $\phi = 0$ 4M

19 Verify Green's theorem for $\int_c (3x^2 - 8y^2)dx + (4y - 6xy)dy$

where c is the region bounded by $x = 0, y = 0$ and $x + y = 1$ 10M

OR

20 (a) Use Divergence theorem to evaluate $\iint_s \overline{f}.\ \overline{n}\ ds$ where

$\overline{f} = x^3i + y^3j + z^3k$ taken over the cube bounded by $x = 0, x = a, y = 0, y = a, z = o, z = a.$ 5M

(b) Find the work done by a force $f = (x^2 - y^2 + x)i - (2xy + y)j$ which moves a particle from $(0,0)$ to $(1,1)$ along the parabola $y^2 = x$

5M