SANT GADGE BABA AMRVATI UNIVERSITY, AMRAVATI
Summer Examination 2020
HVPM's College of Engineering and Technology, Amravati
Department of Mechanical Engineering
Bachelor of Engineering Sem. :- III

Subject :- Engineering Mathematics MIII **Code :-3ME01**

Instructions:-

1) **Solve any two questions**
2) **All question carry equal marks**

Q1.

a) Solve $(D^3 - D^2 - D + 1)y = coshx\,.\,sinx.$ **02 Credit Point**

b) i] Obtain Laplace transform of $\int_0^t e^{-2t} t\, sin^3 t\;\; dt$

ii] Obtain Inverse Laplace transform of $\frac{S+29}{(S+4)\,(S^2+9)}$ **02 Credit Point**

c) Determine the analytic function $f(z) = u + iv$ whose real part is $\cos x \cosh y$

01 Credit Point

d) Prove that the vector function $\vec{A} = (x^2 + xy^2)i + (y^2 + x^2y)j$ is irrotational and find corresponding scalar potential Φ such that $\vec{A} = \vec{\Delta}\,\Phi$ **01 Credit Point**

e) Fit a straight line to following data

X	0	1	2	3	4
Y	1	1.8	3.3	4.5	6.3

02 Credit Point

f) Find real root of the equation $x^3 + x - 1 = 0$ by regula falsi method upto four decimal places.

02 redit Point

Q2.

a) Solve $(D^2 + 5D + 6)y = e^{-2x}.sin2x$ **02 Credit Point**

b) Solve by Laplace transform,

$\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 5y = e^{-x} si\,n\,x$ where $y(0) = 0$ and $y'(0) = 1$ **02 Credit Point**

c) Find the Bilinear transformation which sends the points $1, i, -1$ from z-plane into the points $i, 0, -i$ of w-plane **01 Credit Point**

d) Find the work done in moving a particle once round the circle $x^2 + y^2 = 9,\; z = 0$ under the field of force given by

$F = (2x - y + z)i + (x + y - z^2)j + (3x - 2y + 4z)k$ **01 Credit Point**

e) Solve the following partial differential equations:

i] $((mz - ny)p + (nx - lz)q = ly - mx)$

ii] $z^2(p^2 + q^2 + 1) = 1$ **02 Credit Point**

f) Use picards method to solve the differential equation $\frac{dy}{dx} = x^2 + y^2, given\ y(0), find y_{1,} y_2$

02 Credit Point

Q3

a) Solve $x^3 \frac{d^3y}{dx^3} + 2x^2 \frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 3y = x^2$ **02 Credit Point**

b) i] Evaluate $\int_0^{\infty} \frac{\cos at - cosbt}{t}\ dt$

ii] Using convolution theorem find Laplace transform of $\frac{1}{(s^2+1)^3}$ **02 Credit Point**

c) f(z) is analytic then show that

$$\left(\frac{\delta^2}{\delta x^2} + \frac{\delta^2}{\delta y^2}\right)\ |f(z)|^n = n^2\ |f(z)|^{n-2}\ |f'(z)|^2$$ **01 Credit Point**

d) Evaluate the surface integral $\iint \vec{F}.n\ ds$ where $\vec{F} = (x + y^2)i - 2xj + 2yzk$ ans S is the surface of the plane $2x + y + 2z = 6$ in the first octant. **02 Credit Point**

e) Solve the following partial differential equations

$$yzp + xzq + 2xy = 0$$ **01 Credit Point**

f) Solve by Runge kutta method $\frac{dy}{dx} = \frac{y-x}{y+x},\ \ y(0) = 1$ Find y(0.2) by taking h=0.2 **02 Credit Point**

Q4.

a] Solve $(D^2 + 3D + 2)y = x\ sin3x$ **02 Credit Point**

b) Find Laplace transform of the triangular wave function of period 2c,

Defined by $f(t) = t$ for $0 < t < c$

= (2c- t) for $0 < t < 2c$ **02 Credit Point**

c) If $f(z) = u + iv$ is analytic then find f(z) if its imaginary part is

e^x (x $\cos y - y \sin y$) and show that it is harmonic. **01 Credit Point**

d) Find the directional derivative of the function $\theta = xy^2 + yz^2 + zx^2$ along the tangent to the curve $x = t,\ y = t^2\ , z = t^3$ at the point (1 ,1,1) **01 Credit Point**

e) Solve the following partial differential equations

i] $\left(\frac{\partial z}{\partial y}\right)^2 + \left(\frac{\partial z}{\partial x}\right)^2 = \frac{3a^2}{z^2}$ **02 Credit Point**

f) Solve by Euler's modified method for $\frac{dy}{dx} = y + e^x$ given y(0)=0, find y(0.4) taking h=0.2

02 Credit Point