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

Subject :- Engineering Mathematics MIII **Code :-3ET1**

Instructions:-

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

Q1.

a) 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 $\vec{A} = \overrightarrow{\Delta}\,\Phi$ **01 Credit Point**

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

02 Credit Point

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

02 Credit Point

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

e) Solve the following difference equations $U_{x+2} - 2U_{x+1} + 4U_x = 6$ **01 Credit Point**

f) 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**

Q2. a) Find the Fourier sine and cosine transform of

$$f(x) = \begin{cases} x & for \quad 0 < x < 1 \\ 2 - x & for \quad 1 < x < 2 \\ 0 & for \quad x > 2 \end{cases}$$ **02 Credit Point**

b) 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**

c) 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

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

e) Solve $pq = x^m y^n z^{2l}$ **01 Credit Point**

f) 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**

Q3) a) 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**

b) 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**

c)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**

d) 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**

e) Solve the following partial differential equations

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

ii] $yzp+xzq+2xy=0$ **02 Credit Point**

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

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

Q4. a)Find the Fourier sine and cosine transform of

$$f(x)=\begin{cases}\cos x & for\quad 0<x<a\\ 0 & for\quad x>a\end{cases}$$ **02 Credit Point**

b) 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**

c) 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

d) Solve $(D^2+3D+2)y=x\sin 3x$ **02 Credit Point**

e) Solve the difference equation

$$Y_{n+2}-2\cos\alpha Y_{n+1}+Y_n=\cos n\alpha$$ **01 Credit Point**

f) 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**