


SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR

Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)
Subject with Code :Engineering Mathematics-III (16HS612)
Year & Sem:II-B.Tech & I-Sem Regulation: R16 Course & Branch: B.Tech Com to all
UNIT – I

1. a) Show that $w = \log z$ is analytic everywhere except at the origin and find $\frac{dw}{dz}$. [5M]
 b) If $f(z)$ is analytic function of z prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) \log|f(z)| = 0$ [5M]
2. a) Show that $u = \frac{x}{x^2+y^2}$ is harmonic. [5M]
 b) Find the analytic function whose imaginary part is $e^x(x\sin y + y\cos y)$. [5M]
3. a) Determine p such that the function $f(z) = \frac{1}{2} \log(x^2 + y^2) + i \tan^{-1}\left(\frac{px}{y}\right)$ be an analytic. [5M]
 b) Find all the values of k , such that $f(z) = e^x(\cos ky + i \sin ky)$ [5M]
4. a) If $f(z) = u + iv$ is an analytic function of z and if $u - v = e^x(\sin x - \cos y)$ find $f(z)$ in terms of z . [5M]
 b) Find the analytic function $f(z)$ whose real part is $e^x(x\sin y + y\cos y)$. [5M]
5. a) Show that $f(z) = z + 2\bar{z}$ is not analytic anywhere in the complex plane. [5M]
 b) Show that $\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} = 4 \frac{\partial^2}{\partial z \partial \bar{z}}$ [5M]
6. a) Evaluate line integral $\int f(z) dz$ where $f(z) = y - x - 3x^2i$ and C consists of two straight line segments one from $z = 0$ to $z = i$ and the other from $z = i$ to $z = 1 + i$ [5M]
 b) Evaluate $\int \frac{\cos z - \sin z}{(z+i)^3} dz$ with $C: |z| = 2$ using Cauchy's integral formula. [5M]
7. Calculate $\int f(z) dz$ where $f(z) = \pi e^{x\pi} \pi \bar{z}$ and C is boundary of the square with vertices at the points $0, 1, 1 + i, & i$ where c being in the clockwise direction [10M]
8. Evaluate $\int_0^{1+3i} (x^2 - iy) dz$ along the paths. i) $y = x$ ii) $y = x^2$ [10M]
9. a) Evaluate $\int \frac{\sin^2 z}{\left(z - \frac{\pi}{6}\right)^3} dz$ where $C: |z| = 1$ [5M]
 b) Evaluate $\int \frac{\log z}{(z-1)^3} dz$ where $C: |z - 1| = \frac{1}{2}$ using Cauchy's integral formula. [5M]
10. if C denotes the boundary of the square whose sides lie along the lines $x = \pm 2, y = \pm 2$ Where c is described in the positive sense, evaluate the integrals
 i) $\int \frac{e^{-z}}{\left(z - \frac{\pi i}{2}\right)} dz$ ii) $\int \frac{\cos z}{z(z^2+8)} dz$ [10M]


SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY :: PUTTUR

Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)
Subject with Code :Engineering Mathematics-III (16HS612)
Year & Sem:II-B.Tech & I-Sem Regulation: R16 Course & Branch: B.Tech Com to all
UNIT – II

1. a) Determine the poles of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and the residues at each pole [5M]
 b) Find the residue of the function $f(z) = \frac{1}{(z^2+4)^2}$ where c is $|z - i| = 2$. [5M]
2. a) Find the residues of $f(z) = \frac{z^2}{1-z^4}$ at these singular points which lies inside the circle $|z| = 1.5$ [5M]
 b) Find the residues of $f(z) = \frac{z^2}{z^2+a^2}$ at $z = ai$ [5M]
3. a) Determine the poles of the function $f(z) = \frac{z^2+1}{z^2-2z}$ and the residues at each pole [5M]
 b) Determine the poles and residues of $\tan hz$. [5M]
4. a) Evaluate $\int_{-\infty}^{\infty} \frac{\cos ax}{x^2+1} dx, a > 0$ [5M]
 b) Find the residue of the function $f(z) = \frac{2e^z}{(z-3)z}$ where $c:|z| = 2$. [5M]
5. Evaluate $\int_0^{\pi} \frac{1}{a+b\cos\theta} d\theta = \frac{\pi}{\sqrt{a^2-b^2}}, a > b > 0$ [10M]
6. Show that $\int_0^{2\pi} \frac{\cos 2\theta}{1+2a\cos\theta+a^2} d\theta = \frac{2\pi a^2}{1-a^2}, (a^2 < 1)$ using residue theorem. [10M]
7. a) Find the bilinear transformation which maps the point's $(\infty, i, 0)$ in to the points $(0, i, \infty)$ [5M]
 b) Find the bilinear transformation that maps the point's $(0, 1, i)$ in to the points $1 + i, -i, 2 - i$ in w -plane [5M]
8. a) By the transformation $w = z^2$, show that the circles $|z - a| = c$ (a, c being real) in the Z -plane corresponds to the limacons in the w -plane [5M]
 b) Find the image of the region in the z -plane between the lines $y = 0$ & $y = \frac{\pi}{2}$ under the transformation $w = e^z$. [5M]
9. a) Find the bilinear transformation which maps the points $(\infty, i, 0)$ in to the points $(-1, -1, 1)$ in w -plane. [5M]
 b) Find the bilinear transformation that maps the point's $(1, i, -1)$ in to the points $(2, i, -2)$ in w -plane [5M]
10. a) The image of the infinite strip bounded by $x = 0$ & $x = \frac{\pi}{4}$ under the transformation $w = \cos z$ [5M]
 b) Prove that the transformation $w = \sin z$ maps the families of lines $x = y = \text{constant}$ into two families of confocal central conics. [5M]



SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code :ENG MATHEMATICS-III(16HS612)
Year & Sem: II-B.Tech & I-Sem

Course & Branch: B.Tech(ALL)
Regulation: R16

UNIT -III

- Find a positive root of $x^3 - x - 1 = 0$ correct to two decimal places by bisection method. [10 M]
- Find out the square root of 25 given $x_0 = 2.0, x_1 = 7.0$ using bisection method. [10 M]
- Find out the root of the equation $x \log_{10}(x) = 1.2$ using false position method. [10 M]
- Find the root of the equation $xe^x = 2$ using Regula-falsi method. [10 M]
- Find a real root of the equation $xe^x - \cos x = 0$ using Newton- Raphson method. [10 M]
- Using Newton-Raphson Method
 - Find square root of 10. [5 M]
 - Find cube root of 27. [5 M]
- From the following table values of x and $y = \tan x$ interpolate values of y when $x = 0.12$ and $x = 0.28$

x	0.10	0.15	0.20	0.25	0.30
y	0.1003	0.1511	0.2027	0.2553	0.3093

[10M]

- Using Newtons forward interpolation formula.,and the given table of values

x	1.1	1.3	1.5	1.7	1.9
$f(x)$	0.21	0.69	1.25	1.89	2.61

Obtain the value of $f(x)$ when $x=1.4$ [5M]

- Evaluate $f(10)$ given $f(x) = 168,192,336$ at $x = 1,7,15$ respectively,

use Lagrange interpolation. [5 M]

- Use Newton's Backward interpolation formula to find $f(32)$ given $f(25) = 0.2707, f(30) = 0.3027, f(35) = 0.3386, f(40) = 0.3794$ [5M]
 - Find the unique polynomial $P(X)$ of degree 2 or less such that $P(1) = 1, P(3) = 27, P(4) = 64$ using Lagrange's interpolation formula. [5M]
- Using Lagrange's interpolation formula, find the parabola passing through the points $(0,1), (1,3)$ and $(3,55)$ [5M]
 - For $x=0,1,2,3,4; f(X) = 1,14,15,5,6$ find $f(3)$ using forward difference table. [5M]



SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code :ENG MATHEMATICS-III(16HS612) Course & Branch: B.Tech (All)
Year & Sem: II-B.Tech & I-Sem Regulation: R16

UNIT -IV

1. Fit the curve $y = ae^{bx}$ to the following data. [10 M]

x	0	1	2	3	4	5	6	7	8
y	20	30	52	77	135	211	326	550	1052

2. a) Fit the exponential curve of the form $y = ab^x$ for the data [5 M]

X	1	2	3	4
Y	7	11	17	27

b) Fit a straight line $y = a + bx$ from the following data [5 M]

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

3. a) Fit a second degree polynomial to the following data by the method of **least squares** [10 M]

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

b) Fit a straight line $y = ax + b$ from the following data [5 M]

x	6	7	7	8	8	8	9	9	10
y	5	5	4	5	4	3	4	3	3

4. Fit a Power curve to the following data

x	1	2	3	4	5	6
y	2.98	4.26	5.21	6.10	6.80	7.50

[5M]

b) Fit a second degree polynomial to the following data by the method of **least squares** [5 M]

x	0	1	2	3	4
y	1	5	10	22	38

5. a) Fit the curve of the form $y = ae^{bx}$ [5 M]

x	77	100	185	239	285
y	2.4	3.4	7.0	11.1	19.6

b) Fit the curve of the form $y = ab^x$ for [5 M]

x	2	3	4	5	6
y	8.3	15.4	33.1	65.2	127.4

6. a) Using Simpson's $\frac{3}{8}$ rule, evaluate $\int_0^6 \frac{1}{1+x^2} dx$

[5M]

b) Evaluate $\int_0^1 \sqrt{1+x^3} dx$ taking $h=0.1$ using Trapezoidal rule [5M]

7. Dividing the range into 10 equal parts, find the value of $\int_0^{\pi/2} \sin x dx$ using Simpson's $\frac{1}{3}$ rule. [10M]

8. Evaluate $\int_0^1 \frac{1}{1+x} dx$ [10 M]

i) By trapezoidal rule and Simpson's $\frac{1}{3}$ rule.

ii) Using Simpson's $\frac{3}{8}$ rule and compare the result with actual value.

9. a) Compute $\int_0^4 e^x dx$ by Simpson's $\frac{1}{3}$ rule with 10 subdivisions. [5 M]

b) Find $\int_3^7 x^2 \log x dx$, using Trapezoidal rule and Simpson's rule by 10 sub divisions. [5 M]

10.a) Evaluate approximately, by Trapezoidal rule, $\int_0^1 (4x - 3x^2) dx$ by taking $n=10$. [5M]

b) Evaluate $\int_0^1 e^{-x^2} dx$ taking $h = 0.25$ using Simpson's $\frac{1}{3}$ rule [5M]



SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : ENG MATHEMATICS-III(16HS612)

Course & Branch: B.Tech(ALL)

Year & Sem: II-B.Tech & I-Sem

Regulation: R16

UNIT –V

- 1.a) Tabulate $y(0.1)$, $y(0.2)$, and $y(0.3)$ using Taylor's series method given that $y' = y^2 + x$ and $y(0) = 1$ [5 M]
- b) Find the value of y for $x=0.4$ by Picard's method given that $\frac{dy}{dx} = x^2 + y^2$, $y(0)=0$ [5 M]
2. Using Taylor's series method find an approximate value of y at $x = 0.2$ for the D.E $y' - 2y = 3e^x$, $y(0) = 0$. Compare the numerical solution obtained with exact solution. [10M]
- 3.a) Solve $y' = x + y$, given $y(1)=0$ find $y(1.1)$ and $y(1.2)$ by Taylor's series method [5 M]
- b) Obtain $y(0.1)$ given $y' = \frac{y-x}{y+x}$, $y(0)=1$ by Picard's method. [5 M]
- 4.a) Given that $\frac{dy}{dx} = 1+xy$ and $y(0) = 1$ compute $y(0.1)$, $y(0.2)$ using Picard's method [5 M]
- b) Solve by Euler's method $\frac{dy}{dx} = \frac{2y}{x}$ given $y(1) = 2$ and find $y(2)$. [5M]
- 5.a) Using Runge-Kutta method of second order, compute $y(2.5)$ from $y' = \frac{y+x}{x}$
 $y(2)=2$, taking $h=0.25$ [5M]
- b) Solve numerically using Euler's method $y' = y^2 + x$, $y(0)=1$. Find $y(0.1)$ and $y(0.2)$ [5M]
6. a) Using Euler's method, solve numerically the equation $y' = x + y$, $y(0)=1$ [5M]
- b) Solve $y' = y - x^2$, $y(0) = 1$ by Picard's method upto the fourth approximation. [5 M]
Hence find the value of $y(0.1)$, $y(0.2)$.
- 7.a) Use Runge-kutta method to evaluate $y(0.1)$ and $y(0.2)$ given that $y' = x + y$, $y(0)=1$ [5 M]
- b) Solve numerically using Euler's method $y' = y^2 + x^2$, $y(0) = 1$. Find $y(0.1)$ and $y(0.2)$ [5 M]

8. a) Using R-K method of 4th order, solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$, $y(0)=1$ Find $y(0.2)$ and $y(0.4)$ [6 M]

b) Obtain Picard's second approximate solution of the initial value problem [4M]

$$\frac{dy}{dx} = \frac{x^2}{y^2 + 1}, y(0) = 0$$

9. Using R-K method of 4th order find $y(0.1), y(0.2)$ and $y(0.3)$ given that $\frac{dy}{dx} = 1 + xy, y(0) = 2$ [10M]

10. a) Find $y(0.1)$ and $y(0.2)$ using R-K 4th order formula given that $y' = x^2 - y$ and $y(0) = 1$ [5 M]

b) Using Taylor's series method, solve the equation $\frac{dy}{dx} = x^2 + y^2$

for $x = 0.4$ given that $y = 0$ when $x = 0$. [5 M]