Sample Test Paper-I

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/

ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/AU

Semester   : Second

Subject Title : Engineering Mathematics

17216

Marks   : 25   Time: 1 Hour

Instructions:

1. All questions are compulsory.

2. Illustrate your answers with neat sketches wherever necessary.

3. Figures to the right indicate full marks.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

Q.1 Attempt any THREE of the following.   **09 Marks**

a) Express in the polar form $z = -1 + i$.

b) For what value of x , $f(x) = f(2x + 1)$, if $f(x) = x^2 - 3x + 4$.

c) Evaluate $\lim\limits_{x \to 3} \left[\dfrac{x^2 - 5x + 6}{x^3 + 3x^2 - 18x} \right]$

d) Evaluate $\lim\limits_{x \to 0} \left[\dfrac{\sqrt{1 + x} - \sqrt{1 - x}}{x} \right]$

Q.2 Attempt any TWO of the following.   **08 Marks**

a) Simplify using De Moivre's Theorem $\dfrac{(\cos 3\theta + i \sin 3\theta)^3 (\cos \theta - i \sin \theta)^4}{(\cos \theta + i \sin \theta)^2 (\cos 2\theta + i \sin 2\theta)^{-3}}$.

b) Using Euler's formula, prove that $\cos^2\theta + \sin^2\theta = 1$.

c) If $f(t) = 50 \sin(100\pi t + 0.04)$, show that $f\left(\dfrac{2}{100} + t \right) = f(t)$.

Q.3 Attempt any TWO of the following.   **08 Marks**

a) If $f(x) = \log\left(\dfrac{x}{x-1} \right)$ then show that $f(a+1) + f(a) = \log\left(\dfrac{a+1}{a-1} \right)$

b) Evaluate $\lim_{x \to 0} \left[\dfrac{12^x - 4^x - 3^x + 1}{x^2} \right]$

c) Evaluate $\lim_{x \to \pi/4} \left[\dfrac{2 - \sec^2 x}{1 - \tan x} \right]$

Sample Test Paper-II

Course Name : All Branches of Diploma in Engineering & Technology

Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/

ME/MU/PG/PT/PS/CD/CV/ED/EI/FE/IU/MH/MI/DC/TC/TX/AU

Semester   : Second

Subject Title : Engineering Mathematics

17216

Marks   : 25   **Time: 1 Hour**

Instructions:

1. All questions are compulsory.

2. Illustrate your answers with neat sketches wherever necessary.

3. Figures to the right indicate full marks.

4. Assume suitable data if necessary.

5. Preferably, write the answers in sequential order.

Q.1 Attempt any THREE of the following.   **09 Marks**

    a) Using first principal find the derivatives of cos x.

    b) If x = a cosθ , y =a sinθ , Find $\dfrac{dy}{dx}$ at $\theta = \dfrac{\pi}{4}$

    c) Show that there exists a root of the equation $x^2 - 2x - 1 = 0$ in (–1 , 0) and find it approximately using bisection method by performing two iterations.

    d) Solve the following system of equations by using Gauss elimination method

       x + y + z = 6 , 3x − y + 3z = 10 ,   5x + 5y − 4z = 3

Q.2 Attempt any TWO of the following   **08 Marks**

    a) If u and v are differentiable functions of x , $y = \dfrac{u}{v},$ then Prove that

$$\frac{dy}{dx} = \frac{v\dfrac{du}{dx} - u\dfrac{dv}{dx}}{v^2}$$

    b) Solve the equation $x^3 - 9x + 1 = 0$ using Regula falsi method   (upto three iterations).

    c) Using Newton-Raphson method, evaluate $\sqrt[3]{100}$ performing three iterations.

Q.3 Attempt any TWO of the following   **08 Marks**

a) If $13x^2 + 2x^2y + y^3 = 1$, find $\dfrac{dy}{dx}$.

b) Solve the following equations using Jacobi's method (Perform three iterations)

    $10x + y + 2z = 13$, $3x + 10y + z = 14$, $2x + 3y + 10z = 15$

c) Solve the following equations using Gauss- Seidal method (Perform three iterations)

    $15x + 2y + z = 18$, $2x + 20y -3z = 19$, $3x - 6y + 25z = 20$

Sample Question Paper

Course Name: All Branches of Diploma in Engineering and Technology

Course Code : AE/CE/CH/CM/CO/CR/CS/CW/DE/EE/EP/IF/EJ/EN/ET/EV/EX/IC/IE/IS/ME/

　　　　　　MU/PG/PT/PS/ CD/CV/ED/EI/FE/IU/MH/MI/AU

Semester　　: Second

Subject Title : Engineering Mathematics

Marks　　: 100

17216

Time: 3 Hrs.

Instructions:

1. All questions are compulsory.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

Q.1 Attempt any TEN of the following 　　　　　　　　　　　　　　**20 Marks**

a) If $(3 + i)x + (1 - i)y = 1 + 7i$ find the value of x & y .

b) Express in the form a+ib, $\dfrac{2+i}{1-i}$, 　　where a , b $\in$ R , i = $\sqrt{-1}$.

c) IF $f(x) = x^3 - 3x^2 + 5$, find 　$f(0) + f(3)$.

d) Define even and odd function.

e) Evaluate $\lim\limits_{x\to 2}\left[\dfrac{x-2}{\sqrt{x}-\sqrt{2}}\right]$.

f) Evaluate $\lim\limits_{x\to 0}\left[\dfrac{\tan 5x}{\sin 6x}\right]$.

g) Evaluate $\lim\limits_{x\to 0}\left[\dfrac{e^{\sin 3x}-1}{2x}\right]$.

h) If $y= e^{3x}.\sin 5x$, find $\dfrac{dy}{dx}$.

i) If $y = \log[\ \tan(4 - 3x)\ ]$, find $\dfrac{dy}{dx}$.

j) Find $\dfrac{dy}{dx}$ if $x = 3at^2$ and $y = 2at^3$.

k) Show that there exist a root of the equation $x^3 - 4x +1 = 0$ in the interval (1 , 2) .

l) Find the first iteration by using Jacobi's method for the following system of equation

　　　$5x - y = 9$, $x - 5y + z = - 4$, $y - 5z = 6$.

Q.2 Attempt any FOUR of the following   **16 Marks**

a) Find modulus and argument of $\dfrac{1}{2} - \dfrac{\sqrt{3}}{2}i$, hence express in polar form.

b) Simplify using De Moivre's Theorem

$$\frac{(\cos 2\theta + i\sin 2\theta)^3 (\cos 3\theta - i\sin 3\theta)^4}{(\cos\theta + i\sin\theta)^2 (\cos 2\theta - i\sin 2\theta)^{-3}}$$

c) Use De Moivre's theorem to solve $x^4 + 1 = 0$.

d) If $x + iy = \sin(A + iB)$ prove that

$$\text{i)}\ \frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1 \qquad \text{ii)}\ \frac{x^2}{\sin^2 A} - \frac{y^2}{\cos^2 A} = 1$$

e) If $f(x) = \dfrac{x+2}{4x-3}$ and $t = \dfrac{2+3x}{4x-1}$. Show that $f(t) = x$.

f) If $f(x) = \tan x$, show that

$$\text{i)}\ f(2x) = \frac{2f(x)}{1-[f(x)]^2} \qquad \text{ii)}\ f(\alpha + \beta) = \frac{f(\alpha) + f(\beta)}{1 - f(\alpha).f(\beta)} \ .$$

Q.3 Attempt any FOUR of the following   **16 Marks**

a) If $f(t) = 50\sin(100\pi t + 0.04)$, show that $f(\dfrac{2}{100} + t) = f(t)$

b) If $f(x) = \log\left(\dfrac{1+x}{1-x}\right)$, prove that $f\left(\dfrac{2x}{1+x^2}\right) = 2f(x)$

c) Evaluate $\displaystyle\lim_{x\to 3}\left[\frac{1}{x-3} - \frac{3}{x^3 - 5x^2 + 6x}\right]$

d) Evaluate $\displaystyle\lim_{x\to 2}\left[\frac{x^4 - 8x}{\sqrt{x^2 + 5} - 3}\right]$

e) Evaluate $\displaystyle\lim_{x\to 0}\left[\frac{\cos 4x - \cos 6x}{x^2}\right]$

f) Evaluate $\displaystyle\lim_{x\to 0}\left[\frac{6^x - 3^x - 2^x + 1}{x^2}\right]$

Q.4 Attempt any FOUR of the following   **16 Marks**

a) Using first principle find derivative of $f(x) = \sin x$.

b) If u and v are differentiable functions of x and $y = u.v$, than prove that

$$\frac{dy}{dx} = u.\frac{dv}{dx} + v.\frac{du}{dx}$$

c) If $y = \tan^{-1}\left(\dfrac{\sin x}{1 + \cos x}\right)$, find $\dfrac{dy}{dx}$

d) If $x^3 + y^3 = 3axy$, find $\dfrac{dy}{dx}$

e) Find the derivative of $(\sin x)^{\cos x}$

f) If $x^y = e^{x-y}$ then prove that $\dfrac{dy}{dx} = \dfrac{\log x}{(1 + \log x)^2}$

Q.5 Attempt any FOUR of the following   **16 Marks**

a) Evaluate $\lim\limits_{x \to 0}\left[\dfrac{\sin 2x.\tan 4x.\log(1 + x^2)}{x^4}\right]$

b) Evaluate $\lim\limits_{x \to 3}\left[\dfrac{\log x - \log 3}{x - 3}\right]$

c) Using Bisection method find the approximate root of $x^3 - x - 4 = 0$ [Carry out three iterations only].

d) Find the approximate root of the equation $x^3 - x - 1 = 0$ by using Regula false position method (Carry out three iterations only)

e) By using Newton- Raphson method find the positive root of $x^2 + x - 5 = 0$ correct to three decimal places.

f) Using Newton- Raphson method find approximate value of $\sqrt[3]{100}$, perform three iterations.

Q.6 Attempt any FOUR of the following   **16 Marks**

a) If $y = e^{m\sin^{-1}x}$, prove that $(1 - x^2)\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} - m^2 y = 0$.

b) If $x = a(\theta - \sin\theta)$ and $y = a(1 - \cos\theta)$, find $\dfrac{dy}{dx}$ and $\dfrac{d^2y}{dx^2}$ at $\theta = \dfrac{\pi}{4}$.

c) Solve the following equations by Gauss elimination method
$4x + y + 2z = 12$, $-x + 11y + 4z = 33$, $2x - 3y + 8z = 20$

d) Solve the following equations by Jacobi's method, by performing three iterations only
$10x + y + 2z = 13$, $3x + 10y + z = 14$, $2x + 3y + 10z = 15$

e) Solve the following equations by Gauss- Seidal method taking two iterations
$10x + y + z = 12$, $x + 10y + z = 12$, $x + y + 10z = 12$

f) With the following system of equation $5x - y = 9$, $5y - z = 6$, $x + 5z = -3$.
Set up the Gauss- Seidal iterations scheme for solution. Iterate two times, using initial approximations $x_0 = 1.8$, $y_0 = 1.2$, $z_0 = -0.96$.