

EMS QUESTION BANK 2013-14

3MARKS

- 1) If $f(x)=x^3+x$, find $f(1)+f(2)$.
- 2) If $f(x)=\frac{1}{1-x}$ find $f\{f(x)\}$
- 3) State whether function is even or odd, $f(x)=4x^2+4\cos x+x\sin x+1$
- 4) If $f(x)=x^3-5x\cos x+x^2\sin x$, Show that $f(x)+f(-x)=0$.
- 5) Express following as $x+iy$ form: $\frac{2-3i}{1+2i}$
- 6) Express following as $x+iy$ form: $\frac{2+i}{2-i}$
- 7) Find modulus and amplitude: $-1+i\sqrt{3}$
- 8) Find modulus and amplitude: $\frac{1}{2}-\frac{\sqrt{3}}{2}i$
- 9) Prove that $\sin(ix)=i \sin(hx)$.
- 10) Evaluate: $\lim_{x \rightarrow 2} \frac{x^3-8}{x^2-3x+2}$.
- 11) Evaluate: $\lim_{x \rightarrow 0} \left[\frac{1}{x} - \frac{1}{x^2+x} \right]$
- 12) Evaluate: $\lim_{x \rightarrow 2} \frac{x^9-512}{x-2}$

4Marks

- 1) If $f(x)=\frac{3x+4}{5x-7}$ and $g(x)=\frac{7x+4}{5x-3}$ Show that $f\{g(x)\}=x$
- 2) If $f(x)=\frac{x+1}{x-1}$, $x \neq 1$ show that $x=f(y)$.
- 3) If $f(x)=\frac{x-4}{4x-1}$, show that $f\{f(x)\}=x$.
- 4) If $f(x)=\frac{x+3}{4x-5}$ and $t=\frac{3+5x}{4x-1}$ show that $f(t)=x$.
- 5) Express in polar form: $-2-2\sqrt{3}i$
- 6) Express in polar form: $\frac{1}{2}+\frac{\sqrt{3}}{2}i$
- 7) Find $\left| \frac{z_1}{z_2} \right|$ and $\text{Arg}\left(\frac{z_1}{z_2}\right)$ where $z_1=2+2\sqrt{3}i$ and $z_2=-1+\sqrt{3}i$.
- 8) Express in $x+iy$ form $\frac{1}{(3+i)^2} + \frac{1}{(3-i)^2}$
- 9) Simplify using De Moivre's Theorem $\frac{(\cos 2\theta + i \sin 2\theta) (\cos \theta - i \sin \theta)^3}{(\cos 3\theta + i \sin 3\theta) (\cos 5\theta - i \sin 5\theta)^4}$

10) Separate into Real and Imaginary parts $\frac{(1+i^3)^2}{(3-i)^3}$

11) Separate into Real and Imaginary parts $\frac{i^{47}-3i^{24}}{5i^{88}-2i^{53}}$.

12) Separate into Real and Imaginary parts: $\cosh(x+iy)$

13) Evaluate: $\lim_{x \rightarrow \infty} \frac{2x^2+3x+5}{3x^2-x+7}$

14) Evaluate: $\lim_{x \rightarrow 0} \frac{\sqrt{2+x}-\sqrt{2-x}}{x}$

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

$$\frac{x^2}{\cosh^2 B} + \frac{y^2}{\sinh^2 B} = 1, \frac{x^2}{\sin^2 A} - \frac{y^2}{\cos^2 A} = 1$$

16) Using Euler's Theorem prove that

$$\sin^2 \theta + \cos^2 \theta = 1$$

17) Using Euler's Theorem prove that

$$\cos 2\theta = \cos^2 \theta - \sin^2 \theta$$

Question Bank

Engg. Maths (17216)

4 Marks Question

1) Differentiate w.r.t. x : $y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$

2) If $y = \tan^{-1} \left(\frac{13x}{1-42x^2} \right)$ find $\frac{dy}{dx}$

3) If $y = \sin^{-1} \left(\frac{2x}{1+x^2} \right)$ find $\frac{dy}{dx}$

4) Find $\frac{dy}{dx}$ if $\sin y = \log(x+y)$

5) If $e^x = y^x$ Prove that $\frac{dy}{dx} = \frac{(\log y)^2}{\log y - 1}$

6) If $y = e^{m \sin^{-1} x}$ Prove that $(1 - x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - m^2 y = 0$

7) Differentiate $(\sin x)^{\tan x}$ w.r.t. x

8) Differentiate $\tan^{-1} \left(\frac{2x}{1-x^2} \right)$ w.r.t. $\sin^{-1} \left(\frac{2x}{1+x^2} \right)$

9) Solve using Gauss-Elimination Method:

$$2x - 3y + 4z = 7; \quad 5x - 2y + 2z = 7; \quad 6x - 3y + 10z = 23$$

10) Solve using Jacobie's Method:

$$10x + y + 2z = 13; \quad 3x + 10y + z = 14; \quad 2x + 3y + 10z = 15$$

11) Solve using Jacobie's Method:

$$5x - y + z = 10; \quad 2x + 4y = 12; \quad x + y + 5z = -1$$

12) Solve using Gauss-Seidal Method:

$$10x + y + z = 12; \quad x + 10y + z = 12; \quad x + y + 10z = 12$$

13) Solve using Gauss-Seidal Method:

$$20x + y - 2z = 17; \quad 3x + 20y - z = -18; \quad 2x - 3y + 20z = 25$$

14) Find approximate root of the equation $x^3 - 2x - 5 = 0$ using Bisection method in the interval (2,3) carry out three iterations.

15) Find approximate root of the equation $x^3 + 2x^2 - 8 = 0$ using Regula Falsi method carry out three iterations.

16) Evaluate $\sqrt[3]{7}$ using Newton Raphson Method carry out two iterations.

3 Marks Question

17) If $y = \sin^{-1} x$ Prove that $(1 - x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} = 0$

18) Find $\frac{dy}{dx}$ if $y = e^x \tan x$

19) Find $\frac{dy}{dx}$ if $y = \sec x \tan x$

20) Find $\frac{dy}{dx}$ if $y = \frac{\sin x}{1 - \cos x}$

21) Find $\frac{dy}{dx}$ if $y = \log(x^2 + 2x + 5)$

22) Find $\frac{dy}{dx}$ if $y = x^3 + xy^2 = y^3 + yx^2$

23) Find $\frac{dy}{dx}$ if $x = a \cos^3 \theta$, $y = b \sin^3 \theta$

24) Differentiate w.r.t. x : $7^{\sqrt{x^2+1}}$

25) Find the approximate root of the equation $x^3 - 9x + 1 = 0$ lies between 2 and 3 using bisection method (Two Iteration)

26) Using Bisection method find the approximate value of $\sqrt{10}$ perform two Iteration

27) By using method of False Position find root of equation $x^2 + x - 1 = 0$ in the interval (0,1) (perform two Iteration)

28) Solve following equations for x and y using Gauss-Elimination Method

$$x + y + z = 4; \quad 2x + y + z = 5; \quad 3x + 2y + z = 7$$

29) Solve following equations for y and z using Gauss-Elimination Method

$$x + y + z = 6; \quad 3x - y + 3z = 10; \quad 5x + 5y - 4z = 3$$

30) Show that root of the equation $x \cdot \log x = 1.2$ lies between (1,2)

31) Show that root of the equation $3x - \cos x - 1 = 0$ lies between (0,1)