

Question Bank (I scheme)

Name of subject: Applied Mathematics
Subject code: 22206/22224/22210
Semester: II

Unit Test :I
Course : CH/CM/EJ/IF/IS/ME

Chapter- 1(FUNCTION) ----- (CO 1)

2 marks:

- 1) If $f(x) = \frac{x^2+9}{\sqrt{x-3}}$ find $f(4) + f(5)$
- 2) If $f(x) = x^3 + x$ find $f(1) + f(2)$
- 3) Show that $f(x) = 4x^4 + 3 \cos x + x \sin x + 1$ is an even function.
- 4) If $f(x) = x^3 - \frac{1}{x^3}$ show that $f(x) + f\left(\frac{1}{x}\right) = 0$
- 5) If $f(x) = ax^2 - bx - 1$, $f(2) = 5$, $f(-2) = 10$ then find 'a' and 'b'.

4 marks:

- 1) If $f(x) = \frac{x+3}{4x-5}$ and $t = \frac{3+5x}{4x-1}$ show that $f(t) = x$.
- 2) If $f(x) = \frac{3x+4}{4x-1}$ show that $(f \circ f)(x) = x$.
- 3) If $f(x) = \log\left(\frac{1+x}{1-x}\right)$ show that $f(a) + f(b) = f\left(\frac{a+b}{1+ab}\right)$.

Chapter 2 (DERIVATIVE) ----- (CO 1)

2 marks-

- 1) If $y = \sin^{-1}x$ Prove that $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 0$
- 2) Find $\frac{dy}{dx}$ if $y = e^x \tan x$
- 3) Find $\frac{dy}{dx}$ if $y = \sec x \tan x$
- 4) Find $\frac{dy}{dx}$ if $y = \frac{\sin x}{1 - \cos x}$
- 5) Find $\frac{dy}{dx}$ if $y = \log(x^2 + 2x + 5)$
- 6) Find $\frac{dy}{dx}$ if $y = x^3 + xy^2 = y^3 + yx^2$
- 7) Find $\frac{dy}{dx}$ if $x = a \cos^3 \theta$, $y = b \sin^3 \theta$
- 8) Differentiate w.r.t. x : $7^{\sqrt{x^2+1}}$

4 marks-

- 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. $\sin^{-1} \left(\frac{2x}{1+x^2} \right)$

Chapter 3 (APPLICATION OF DERIVATIVE) ----- (CO 1)

2 marks-

- 1) Find slope of tangent and normal to the curve $x^2 + y^2 = 25$ at $(-3, 4)$
- 2) Find slope of tangent and normal to the curve $y = x^2 - 4x + 2$ at $(1, -1)$
- 3) Find point on the curve $y = 3x - x^2$ where the slope is -5.
- 4) Find point on the curve $y = e^x$ where the slope is 1.
- 5) Find the radius of curvature of the curve $y = x^3$ at $(1, 1)$.
- 6) Find the radius of curvature of the curve $y = x^2 + 2$ at $(0, 2)$.

4 marks-

- 1) Find Maximum and minimum value of $x^3 - 9x^2 + 24x$.
- 2) Find Maximum and minimum value of $2x^3 - 3x^2 - 36x + 10$.
- 3) A rectangle has an area 50 sq. cm. Find its dimensions when perimeter is least.
- 4) Divide 80 into two parts such that their product is maximum.
- 5) Show that $\frac{x}{a} + \frac{y}{b} = 2$ is a tangent to the curve $\left(\frac{x}{a}\right)^n + \left(\frac{y}{b}\right)^n = 2$ at (a, b) .
- 7) A box with a square base is to have an open top. The area of the material for making the box is 192 sq.cm. What should be the dimensions in order that the volume is as large as possible.
- 8) The slope of the curve $y^2 = ax^3 + b$ at $(-1, 1)$ is same as the slope of $2x - y = 0$. Find a and b .

Chapter- 4 (INTEGRATION-INDEFINITE) ----- (CO 1)

2 marks:

- 1) Evaluate : $\int \frac{dx}{\sqrt{4x^2-9}}$
- 2) Evaluate : $\int \frac{3x+2}{2x-1} dx$
- 3) Evaluate : $\int \sin^2 2x dx$
- 4) Evaluate : $\int \tan^{-1} \sqrt{\frac{1-\cos x}{1+\cos x}} dx$

4 marks:

- 1) Find $f(x)$, if $f'(x) = 7 + 6x - 3x^2$ and $f(-1) = 0$.
- 2) If $f'(x) = ax + b$ find $f(x)$, given $f(1) = 5, f(2) = 13$ and $f(0) = 1$.
- 3) Evaluate : $\int \frac{x^4}{x^2+1} dx$
- 4) Evaluate : $\int \tan^{-1} \left(\frac{\sin x}{1+\cos x} \right) dx$
- 5) Evaluate : $\int \frac{1}{\sqrt{1-x^2} \cdot (\sin^{-1} x)^2} dx$
- 6) Evaluate : $\int \tan^3 x dx$
- 7) Evaluate : $\int \frac{1}{x \log x \log (\log x)} dx$
- 8) Evaluate : $\int \frac{e^x(x+1)}{\sin^2(xe^x)} dx$
- 9) Evaluate : $\int \frac{1}{\sqrt{a^2-x^2}} dx$
- 10) Evaluate : $\int \sin^3 x \cdot \cos^2 x dx$