

PROBABLE QUESTION

SUBJECT: ENGG. MATHEMATICS-II

1. All question carries 2marks each.

(a) Find the value of  $\lambda$  so that the vector  $2\hat{i} + \hat{j} - \hat{k}$  is perpendicular to the vector  $\hat{i} - \hat{j} + \lambda\hat{k}$ .

(b) Evaluate  $\lim_{x \rightarrow 0} \frac{\tan^{-1} x}{x}$ .

(c) Differentiate  $\sqrt{x}$  w.r.t  $x^2$ .

(d) If  $(x, y) = \sin^{-1}\left(\frac{x}{y}\right)$ , then find  $\frac{\partial f}{\partial x}$  and  $\frac{\partial f}{\partial y}$ .

(e) Evaluate  $\int x \sin x^2 dx$ .

(f) Check whether the function  $f(x, y) = x^2y^2 + 4xy^3 - 3x^3y$  is homogeneous or not.

(g) Find the derivative of  $\tan^{-1} x$  with respect to  $\tan^{-1} \sqrt{1+x^2}$ .

(h) Evaluate  $\int_0^1 \frac{\log x}{x} dx$ .

(i) Find the order and degree of the differential equation  $\left(\frac{dy}{dx}\right)^2 + y^3 = \frac{d^2y}{dx^2}$ .

(j) Find the value of  $(2\hat{i} + 3\hat{j} - \hat{k}) \cdot X(\hat{i} + \hat{k})$ .

2. All question carries 5 marks each.

(a) Evaluate  $\lim_{x \rightarrow 0} \left(\frac{x \tan x}{1 - \cos x}\right)$

(b) Find the value of k for which the function  $f(x) = \begin{cases} \frac{\sin 7x}{5x} & \text{if } x \neq 0 \\ k & \text{if } x = 0 \end{cases}$  is continuous at  $x=0$ .

(c) Find  $\frac{dy}{dx}$ , when  $x^y = y^x$ .

(d) Find the local maxima and local minima for the function  $(x) = 2x^4 - 2x^3 - x^2$ .

(e) Evaluate  $\int \frac{x^3}{(x^2+1)^3} dx$ .

(f) Evaluate  $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx$

(g) Solve  $e^x \tan y dx + (1 + e^x) \sec^2 y dy = 0$

(h) Find the scalar and vector projection of the vector  $\vec{a} = 2\hat{i} - 3\hat{j} + 6\hat{k}$  on the vector  $\vec{b} = 3\hat{i} - 6\hat{j} + 2\hat{k}$ .

3. All question carries 10 marks each.

(a) Differentiate  $y = \cos^2\left(\cos^{-1} \sqrt{\frac{1+x}{1-x}}\right)$ .

(b) Evaluate  $\int e^{2x} \sin x dx$ .

(c) Solve  $(1+x^2) \frac{dy}{dx} + 2xy = x^3$ .

(d) If  $f(x) = \begin{cases} ax^2 + b, & \text{if } x < 1 \\ 1, & \text{if } x = 1 \\ 2ax - b, & \text{if } x > 1 \end{cases}$  is continuous at  $x=1$ , then find a and b.

(e) if  $x = \sin t$ ,  $y = \sin(pt)$ , then show that  $(1-x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} + p^2y = 0$ .

(f) Find the total area of the circle  $x^2 + y^2 = 16$ .