THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Solve the following: **(6x5=30)**

1. Find the domain of the real valued function given by $f(x) = \sqrt{2 + x} + \sqrt{7 - x}$.

2. Find the values of x which satisfy the inequality $2x^2 - 25x + 12 > 0$.

3. Find the derivative of the function $5^{\ln(\cos x)}$

4. Evaluate the integral $\int x^3 \sqrt{x^2 + 1}\, dx$.

5. Evaluate the definite integral $\int_{-3}^{7} |x - 5|\, dx$.

6. Evaluate the limit
$$\lim_{x \to 2} \frac{x^2 + x - 6}{8 - x^3}.$$

Q.2. Solve the following: **(3x10=30)**

1. Find the values of the constants a and b if the given function is continuous and differentiable at $x = \frac{\pi}{6}$,
$$f(x) = \begin{cases} \sin(2x), & 0 < x \le \frac{\pi}{6}; \\ ax + b, & \frac{\pi}{6} < x \le 1. \end{cases}$$

2. Find $\frac{dy}{dx}$ by implicit differentiation for the the curve $\ln(x^2 + y^2) = y^3$.

3. Evaluate $\int \frac{5x^2 + 9}{x\sqrt{x^2 + 16}}\, dx$.