

Ph. D Entrance Test – MATHEMATICS Sample Paper

1. The following differential equation has

$$3\left(\frac{d^2 y}{dt^2}\right) + 4\left(\frac{dy}{dt}\right)^3 + y^2 + 2 = x$$

- (a) degree = 2 ,order = 1
 (b) degree = 1, order = 2
 (c) degree = 4 ,order = 3
 (d) degree = 2 ,order = 3

2. A fair dice is rolled twice. The probability that an odd number will follow an even number is

- (a) 1/2 (b) 1/6
 (c) 1/3 (d) 1/4

3. The value of integral

$$I = \frac{1}{\sqrt{2\pi}} \int_0^{\infty} \exp\left(-\frac{x^2}{8}\right) dx \text{ is}$$

- (a) 1 (b) π
 (c) 2 (d) 2π

4. In what range should $\text{Re}(s)$ remain so that the Laplace transform of the function $e^{(a+2)+5}$ exists.

- (a) $\text{Re}(s) > a+2$ (b) $\text{Re}(s) > a+7$
 (c) $\text{Re}(s) < 2$ (d) $\text{Re}(s) > a+5$

5. Let $A = \begin{bmatrix} 2 & -0.1 \\ 0 & 3 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1/2 & a \\ 0 & b \end{bmatrix}$

then $(a+b) =$

- (a) 7/20 (b) 3/20
 (c) 19/60 (d) 11/20

6. The value of the contour integral

$$\oint_{|z-j|=2} \frac{1}{z^2 + 4} dz \text{ in positive sense is}$$

- (a) $\frac{j\pi}{2}$ (b) $-\frac{\pi}{2}$

- (c) $-\frac{j\pi}{2}$ (d) $\frac{\pi}{2}$

7. The integral $\int_0^{\pi} \sin^3 \theta d\theta$ is given by

- (a) 1/2 (b) 2/3
 (c) 4/3 (d) 8/3

8. In the Taylor series expansion of $\exp(x) + \sin(x)$ about the point $x = \pi$, the coefficient of $(x - \pi)^2$ is

- (a) $\exp(\pi)$ (b) $0.5\exp(\pi)$
 (c) $\exp(\pi) + 1$ (d) $\exp(\pi) - 1$

9. The system of linear equations $4x + 2y = 7$, $2x + y = 6$ has

- (a) a unique solution
 (b) no solution
 (c) an infinite number of solution
 (d) exactly two distinct solution

10. For real values of x the minimum value of the function $f(x) = \exp(x) + \exp(-x)$ is

- (a) 2 (b) 1
 (c) 0.5 (d) 0