



**Dhirubhai Ambani Institute of Information and
Communication Technology**
Ph.D. Mathematics Sample Paper
Mathematics

1. Let $\{a_n\}_{n=1}^{\infty}$ be a sequence of real numbers. Which of the following is false

- (a) If $\{a_n\}_{n=1}^{\infty}$ is convergent then it is bounded
- (b) $\{a_n\}_{n=1}^{\infty}$ has a convergent subsequence
- (c) If $\{a_n\}_{n=1}^{\infty}$ is Cauchy then it is bounded
- (d) If $\{a_n\}_{n=1}^{\infty}$ is bounded then it has a least upper bound
- (e) None of the above

Answer b)

2. The value of the contour integral $\oint_C z^n dz$ where C is a circle of radius $r > 0$ around the origin for $n \neq -1$ is

- (a) 0
- (b) 1
- (c) $2\pi i$
- (d) $\frac{1}{2}$
- (e) None of the above

Answer a)

3. Bin A contains 3 red and 5 blue balls, bin B contains 2 red and 4 blue balls. A bin is selected at random and a ball is drawn and found to be red. What is the probability that the ball came from bin A?

- (a) $\frac{8}{17}$
- (b) $\frac{6}{17}$
- (c) $\frac{9}{17}$
- (d) $\frac{5}{17}$
- (e) None of the above

Answer c)

4. Which of the following is FALSE

- (a) A Symmetric group S_n is not cyclic for every $n > 2$
- (b) Every group of order 4 is cyclic
- (c) A group of prime order is abelian
- (d) Every group is isomorphic to a subgroup of the group of permutations
- (e) None of the above

Answer b)

5. Let $A = \begin{pmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{pmatrix}$ then $\det(A) =$

- (a) 0
- (b) 1
- (c) xyz
- (d) $(x - y)(x - z)(y - z)$
- (e) None of the above

Answer d)