

Subject : Probability & Combinatorics

Day : Friday
Date : 10/06/2016



Time : 02.00 P.M. TO 05.00 P.M.
Max Marks : 80 Total Pages : 2

N.B.:

- 1) Attempt any **FIVE** questions from Section – I and any **TWO** questions from Section – II.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SAME** answer book.

SECTION-I

- Q.1** a) Find the values of C (10, 3) and P (20, 4). (05)
b) State and Prove Total Probability Theorem. (05)
- Q.2** a) What is the chance that a non leap year should have fifty three Sundays and a leap year should have 53 Mondays? (05)
b) Write a short note on moment generating functions. (05)
- Q.3** a) What is the coefficient of $x^5 y^8$ in the expansion of $(x + y)^{13}$? (05)
b) Explain various application areas of Simulation. (05)
- Q.4** a) Define Normal distribution. State its mean and variance. (05)
b) Solve recurrence relation: (05)
 $a_n - 2a_{n-1} + 2a_{n-2} - a_{n-3} = 0$; for $n \geq 3$; given $a_0 = 2, a_1 = 1, a_2 = 1$.
- Q.5** a) Define random experiment, events and sample space with example. (05)
b) A parcel of 12 books contains 4 books with loose binding. What is the probability that random selection of 6 books (without replacement) will contain 3 books with loose binding? (05)
- Q.6** a) Three unbiased dice are rolled. What is the probability that the highest value is twice the lowest? (05)
b) Probability of a continuous random variable is given as: (05)
 $f(x) = C(4x - 2x^2)$ for $0 < x < 2$
= 0 otherwise
Find i) C ii) $P(X > 1)$

P. T. O.

- Q.7** Write short notes on any **TWO** of the following: **(10)**
- a) Geometric distribution
 - b) Independence of events
 - c) Inclusion Exclusion principle

SECTION- II

- Q.8 a)** State and prove Pigeonhole principle. **(07)**
- b)** Probability mass function of a random variable is given as **(08)**
 $P(X = i) = 2^{-i}$ for $i = 1, 2, 3, \dots$
- i) Verify $P(X = i) = 2^{-i}$ is a *p.m.f.*
 - ii) Find mean and Variance.
- Q.9 a)** State and prove Bayes' theorem. **(07)**
- b)** An urn contains 4 balls. Two balls drawn randomly are found to be white in colour. What is the probability that all the four balls in an urn are white in colour? **(08)**
- Q.10 a)** Define Binomial distribution. What is its probability mass function? State its mean and variance. How Poisson distribution can be approximated to Binomial distribution. **(07)**
- b)** There are 10 adjacent parking places in a parking lot. When you arrive there are already 7 cars in the parking lot. What is the probability that you can find 2 adjacent unoccupied places for your car? **(08)**

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