BCA–203 (O)

B. C. A. (Second Semester)
EXAMINATION, May, 2012

(Old Course)

Paper Third

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE – II

Time : Three Hours]   [Maximum Marks : 75

Note : Section A is compulsory. Attempt *seven* questions out of ten questions from Section B and *one* question from Section C. Calculator is allowed.

Section – A

1. Define the following :   10

   Poisson distribution, Independent Events, Platikurtic Curve, Standard Error and Mean deviation.

2. (a) Three cards are drawn at random from a pack of well shuffled 52 cards. What is the probability of drawing two kings and one non-king ?   3

   (b) Find the mean of the deviations taken from the mode of the following data :   2

   2, 4, 8, 8, 6, 10, 4, 8, 10, 12

Section – B   7 each

3. Define the following with one example of each :

   (i)   Null Hypothesis

   (ii) Degrees of Freedom

4. If x and y are independent random variables prove that :

$$E(xy) = E(x)\, E(y)$$

5. If a random variable x has the probability density function as follows :

$$f(x) = \begin{cases} (3-x)/4 \,, & 0 < x < 2 \\ 0 \,, & \text{elsewhere} \end{cases}$$

   then find :

   (i) $p(x < 1)$

   (ii) $p\left(\dfrac{1}{2} < x < \dfrac{3}{2}\right)$

6. State central limit theorem and verify it for the following :

$$P(X_k = \pm k^\alpha) = \frac{1}{2} k^{-2\alpha}$$

$$P(X_k = 0) = 1 - k^{1-2\alpha}, \left(\alpha < \frac{1}{2}\right)$$

7. A and B play a game of tossing a coin and the one who first throws an H wins the game and the game terminates. If A begins the game and each player wins an amount of money out of ₹ 900 equal to his expectation, find their respective expectation.

8. Prove that :

$$P(A \mid B) + P(\overline{A} \mid B) = 1$$

   where symbols have their usual meaning.

9. State and prove multiplicative law of probability.

10. Out of every ten bombers sent for bombing energy targets 8 return safely. If five bombers are sent for bombing find the probability that :

    (a) exactly three will return safely

    (b) at least 4 will return safely.

11. Define t, χ^2 and F distributions.

12. State and prove Baye's theorem.

<div align="center">Section — C</div> <div align="right">11 each</div>

13. If skulls are classified as A, B, C, according to the length, breadth index is under 75, between 75 and 80 and over 80. Assuming the distribution to be normal find the mean and S. D. of a series in which A are 58%, B are 38% and C are 4%. You are given that if :

$$f(t) = \frac{1}{\sqrt{2\pi}} \int_t^0 \exp(-t^2)\, dt, \text{ then}$$

$$f(\cdot 2) = \cdot 08 \text{ and } f(1\cdot 75) = 0\cdot 46.$$

14. The diameter of an electric cable is assumed to be a continuous random variate with probability density function :

$$f(x) = \begin{cases} \dfrac{3}{4}(2x - x^2)\,, & 0 \le x \le 2 \\ 0 & , \text{ elsewhere} \end{cases}$$

    (a) Verify it is a p. d. f.

    (b) Find $\bar{x}$ and σ.

15. Define the following :

    (i)   Unbiasedness

    (ii)   Consistancy

    (iii) Interval estimation

    (iv)   Type I and Type II errors

    (v)   Level of significance

<div align="right">1100</div>