MA/M.Sc.—Math-IIS (205)

2019

Time : 3 hours

Full Marks : 80

Answer from **both** the Sections as directed

The figures in the right-hand margin indicate marks

Candidates are required to answer in their own words as far as practicable

(MATHEMATICS)

SECTION – A

1. Answer any *four* of the following : 4 × 4

(*a*) The chance of X solving a particular problem is $\frac{2}{3}$ and the chance of Y solving the problem is $\frac{3}{4}$. What is probability that the problem is solved ?

(*b*) Let X denote the number of heads in a single toss of 4 fair coins. Determine (*i*) $P(X<2)$ and (*ii*) $P(1<X\leq 3)$.

(*c*) A continuous random variable X has the distribution function

$$F(x)=\begin{cases}0 & \text{if } x\leq 1\\ k(x-1)^4 & \text{if } 1\leq x\leq 3\\ 1 & \text{if } x>3\end{cases}$$

(*d*) Six cards are drawn from a well-shuffled pack of 52 cards, find the probability that (*i*) at least three diamonds (*ii*) none is a diamond.

(*e*) Find mode of Poisson distribution.

Or

2. Answer *all* questions of the following : 2 × 8

(*a*) State the axioms of probability.

(*b*) If $P(A) = 1/3$, $P(B) = 1/4$, $P(A\cup B) = 1/2$, then find $P(B/A)$ and $P(A/B')$.

(*c*) Define conditional probability.

(*d*) For the continuous probability function

$$F(x) = Kx^2e^{-x} \text{ when } x\geq 0,$$

Find K and mean.

(*e*) In θ throws of a die 5 or 6 is considered as success. Find the mean number of success and the standard deviation.

(*f*) If X is a normal variate with mean 30 and standard deviation 5. Find $P(X\geq 45)$.

(*g*) If variance of Poisson distribution is 3, find $P(x=0)$.

(*h*) Define independent and dependent events.

SECTION – B

Answer **all** questions : 16 × 4

3. (*a*) State and prove total probability theorem.

Or

(*b*) An urn A contains 5 white and three black balls, Another urn B contains 3 white and 5 black balls. 2 balls are taken from urn A randomly and replaced in urn B. Now one ball is taken from urn B what is probability that it is a white ball ?

4. (*a*) 12 coins are thrown simultaneously. Find the probability of getting at least 5 heads.

Or

(*b*) A continuous random variable has the probability distribution function

$$F(x) = \begin{cases} 2e^{-2x} & \text{if } x > 0 \\ 0 & \text{elsewhere} \end{cases}$$

Find the probabilities that it will take on a value (*i*) between 1 and 3 and (*ii*) greater than 0·5.

5. (*a*) Find mode and variance of binomial distribution.

(*Continued*)

Or

(*b*) In a distribution exactly normal 7% of the items are under 35 and 89% are under 63. What are the mean and standard deviation of the distribution ?

6. (*a*) Define the negative binormal distribution and find mean variance and generating function for this distribution.

Or

(*b*) What do you understand by Bernoulli distribution ? Find mean and mode of this distribution.

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