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2810E539

Candidate's Seat No :_____

B.Sc. Sem-6 Examination

S.E 311

Mathematics (A) Convax Ana.

October 2021

Time : 2-00 Hours] **[Max. Marks : 50**

Instruction : (i) Attempt any THREE questions in Section-I.

(ii) Section-II is a compulsory section of short questions.

(iii) Notations are usual everywhere.

(iv) The right hand side figures indicate marks of the sub question.

SECTION-I

Attempt any THREE of the following questions :

Q-1 (*a*) Define Convex and concave functions on an interval I.
Also show that the function $f : R \to R$ defined as $f(x) = x^2$ is a convex on R. [7]

(*b*) If I is an interval and $f : I \to R$ is a strictly increasing function on I such that $f(I)$ is an interval then show that the function f one-one and continuous on I. [7]

Q-2 (*a*) If the polynomial function $f: R \to R$ is defined as $f(x) = x^4 - 8x^3 + 22x^2 - 24x + 7$ then check the differentiability and monotonicity of f. [7]

(*b*) If the function $f: R \to R$ is defined as $f(x) = x^4 + 2x^3 - 36x^2 + 62x + 5$ then check double differentiability of f and also discuss the convexity/ concavity of the function f. [7]

Q. 3 (*a*) Define following terms with one illustration of each:
Deterministic and random processes, random experiment,
Subjective and objective probability, elementary events. [7]

(*b*) A balanced die is tossed twice Write the elements of the following:
(i) Sample space.
(ii) A = Event that sum of the integers on two dice is 7 or 10.
(iii) B = Event that integers on dice are odd.
(iv) C = Event that sum of integers on two dice is divisible by 3.
(v) D = Event that sum of integers on two dice is greater than 6.
Also check whether events A and D are mutually exclusive or not and find probabilities of events A, B, C and D. [7]

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Q. 4(*a*) Define Classical definition of probability. State additive rule of probability for two and three events. If two events A, B and C are mutually exclusive events, then state the values of P[AUB] and P[AUBUC]. Given two events A and B such that P[A] = 0.32, P[B] = 0.50 and P[AUB] = 0.75, then find P[A∩B]. [7]

(*b*) Two balanced dice were tossed once. Write sample space and Find the probability of the following events:

(i) 3 or more on a first die and 6 on a second die

(ii) 1on first die and a multiple of 2 on second die.

(iii) Sum of numbers on two dice is 9

(iv) Sum of numbers on two dice is divisible by 7. [7]

Q. 5 (*a*) Stating conditions for deriving binomial distribution, state its probability function of binomial distribution. If the mean and variance of binomial distribution are 18 and 1/3, then, find parameters of binomial distribution. [7]

(*b*) If a random variable X follows poisson distribution with parameter m= 2, state values of mean *(E(X))*, variance *(V(X))*, E(X+4), E(2X-3), V(4X). Also, find P(X=1), P(X<2). [7]

Q. 6 (*a*) Suppose a die is tossed 5 times. An integer 4 appears is treated as a random variable x, then mention probability distribution of X as a binomial distribution.

Also, find probability that 4 appears (i) exactly 2 times, (ii) more than 3 times (iii) between 2 to 4 times. [7]

(*b*) State the probability function of a normal distribution.

Also, state the relationship between mean, median and mode of a normal distribution. Do you agree that the normal distribution is symmetric one? [7]

SECTION-II

Q. 7 Answer ***ANY FOUR*** of the followings in **Short**: **[8]**

(i) Define Hyper Plane and Convex hull of a set.

(ii) If A = $\{(x,y) \in R^2 / x^2 + y^2 = 4\}$ then find the convex hull of A.

(iii) Define classical and axiomatic definition of probability.

(iv) State addition rule of probability for three events.

(v) Give one application of binomial distribution.

(vi) State moment generating function of binomial distribution.

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