PBB-003-1013018

Seat No. ______

B. Sc. (Sem. III) (CBCS) Examination

November / December - 2018

Statistics : Paper - 301

(New Course)

Faculty Code : 003
Subject Code : 1013018

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.
(2) All questions carry equal marks.
(3) Student can use own scientific calculator.

1 (a) Give the answer of following question : **4**

(1) When all possible outcomes are included, they are known as __________.

(2) __________ districts words can be formed by using all the letters of the HONEY.

(3) Intersection of two mutually exclusive events is a __________ event.

(4) If $P(A) = p_1, P(B) = p_2$ and $P(A \cap B) = p_3$, then $P\left(\frac{A}{B}\right)$ = __________.

(b) Write any **one** : **2**

(1) If $3^n P_3 = 2^{(n+1)} P_3$ then find the value of n.

(2) Prove that, if A is happening event and A' is not happening event then $P(A) + P(A') = 1$.

(c) Write any **one** : **3**

(1) If A and B are any two events (subset of sample space S) and are not disjoint, then prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

(2) An urn contains 3 red and 7 white balls. A ball is drawn at random from the urn and in its place a ball of other colour is put. If now one ball is drawn from the urn, find the probability that it is red.

(d) Write any **one** : **5**

(1) How many three digit numbers can be formed from the digits 0, 1, 2, 3, 4, 5, 6. If each digit can be used once only? How many of these are odd numbers? How many are greater than 330 ?

(2) Three machine in a factory produce respectively 20%, 50% and 30% of items daily. The percentage of defective items of these machines are respectively 3, 2 and 5. An item is taken at random from the production and is found to be defective. Find the probability that it is produced by first machine.

2 (a) Give the answer of following question : **4**

(1) $\beta_2 < 3; \gamma_2 < 0$ then curve is known as ________.

(2) The probability density function $f(x)$ cannot exceed ________.

(3) The third moment about mean measures ________.

(4) If $V(2x \pm 2)$ then equal to________.

(b) Write any **one** : **2**

(1) If X and Y are two independent continuous random variables then prove that $E(XY) = E(X)E(Y)$ provided all the expectations exit.

(2) 10,000 tickets each of Re. 1 are sold in a lottery. There is only one ticket in the lottery bearing a prize of Rs. 8000. A person is having one ticket of the lottery. Find his expectation.

(c) Write any **one** : **3**

(1) If $X_1, X_2, X_3, ...X_n$ be n random variables then

$$V\left(\sum_{i=1}^{n} a_i X_i\right) = \sum_{i=1}^{n} a_i^2 V(X_i) = 2\sum_{i=1}^{n} \sum_{\substack{j=1 \\ i<j}}^{n} a_i a_j Cov(X_i, X_j)$$

(2) Obtain relation between rth central moment and rth raw moment. Also obtain relation between first four central moment and raw moment.

(d) Write any **one** : **5**

(1) First, second and third raw moments are a, b and c respectively which obtain from point t, then prove that (i) $\overline{x} = a + t$ (ii) $\mu_2 = b - a^2$

(iii) $\mu_3 = c - 3ab + 2a^3$.

(2) Obtain relation between cumulants and moments. Also show that $\mu_4 = k_4 + 3k_2^2$.

3 (a) Give the answer of following question : **4**

(1) If Binomial distribution function is

$$p(x)=\binom{16}{x}\left(\frac{1}{4}\right)^{x}\left(\frac{3}{4}\right)^{16-x}$$ then variance are ____________.

(2) If $x_1 \sim B(p, n_1)$ and $x_2 \sim B(p, n_2)$ two independent Binomial variates then $x_1 + x_1 \sim$ ____________.

(3) The central moment generating function (c.m.g.f.) of Binomial distribution is ____________.

(4) If $p < \frac{1}{2}$ then Binomial distribution is ____________.

(b) Write any **one** : **2**

(1) Obtain mean and variance of Bernoulli distribution.

(2) For a Binomial variate $n = 10$ and $P(x = 5) = 2\ P(x = 4)$ find value of p.

(c) Write any **one** : **3**

(1) Obtain moment generating function of Binomial distribution and find its mean and variance.

(2) Obtain cumulants generating function of Binomial distribution and find k_1, k_2 and k_3.

(d) Write any **one** : **5**

(1) For Binomial distribution prove that

$$\mu_{(r+1)} = pq\left[nr\mu_{(r-1)} + \frac{d\mu_r}{dp}\right]$$

(2) For Binomial distribution prove that $k_{(r+1)} = pq\dfrac{dk_r}{dp}$.

4 (a) Give the answer of following question : **4**

(1) In Poisson distribution mean __________ variance.

(2) The central moment generating function (c.m.g.f.) of Poisson distribution __________.

(3) If Poisson distribution $p(x) = \dfrac{e^{-4}4^x}{x!}; x = 0, 1, 2, \ldots\ldots$ then standard deviation is __________.

(4) For Poisson distribution, if $p(2) = p(3)$, then its probability function will be $p(x)$ __________.

(b) Write any **one** : **2**

(1) Between the hours of 2 and 4 p.m. the average number of phone calls per minute coming into the switch board of a company is 2.5. Find the probabilities that during one particular minute there will be exactly 3 calls.

(2) For a Poisson variate 3P(x=2) = P(x=4). Find mean and standard deviation.

(c) Write any **one** : **3**

(1) Without using moment generating function obtain mean and variance of Poisson distribution.

(2) Obtain moment generating function and central generating function of Poisson distribution.

(d) Write any **one** : **5**

(1) For Poisson distribution prove that

$$\mu_{(r+1)} = rm\,\mu_{(r-1)} + m\frac{d\mu_r}{dm}$$

(2) Prove that Poisson distribution is limiting case of the Binomial distribution.

5 (a) Give the answer of following question : **4**

(1) The mode of Normal distribution is 60 with S.D. 10, and then its median is ___________.

(2) Negative Binomial distribution $NB\ (r,\ p)$ reduces to Geometric distribution when ___________.

(3) Under shifting of time origin in Geometric distribution, the p.d.f. remains the same. This property is known as ___________.

(4) The probability of a success changes from trial to trial in ___________.

(b) Write any **one** : **2**

(1) Obtain moment generating function of Negative Binomial distribution.

(2) The probability that a person can hit a target is 0.6. Find the probability that he will hit the target first time at the fifth trial.

(c) Write any **one** : **3**

(1) Obtain moment generating function of Geometric distribution and find its mean and variance.

(2) The probability that a person can hit a target is 0.6. He is to be given a prize when he hits the target for the 4^{th} time. Find the probability that he will require more than 8 trials to obtain the prize.

(d) Write any **one** : **5**

(1) In a normal distribution 31% of the observations are less than 45 and 8% are more than 64. Find mean and standard deviation of the distribution.

(2) Show that Hyper Geometric distribution is approximation to Binomial distribution.