



JAF-003-1013018 Seat No. _____

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

November - 2019

Statistics : 301

[New Course]

Faculty Code : 003

Subject Code : 1013018

Time : **2.30** Hours]

[Total Marks : **70**

Instructions :

- (1) All questions are compulsory.
- (2) All questions carry equal marks.

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

- (1) _____ districts words can be formed by using all the letters of the SUNDAY.
- (2) In statistical probability n is never _____.
- (3) When all possible outcomes are included, they are known as _____.
- (4) If $P(A) = p_1$, $P(B) = p_2$ and $P(A \cap B) = p_3$, then
 $P(\bar{A} \cup \bar{B}) =$ _____.

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

(1) Prove that, if A and B are independent events, then A' and B' are also independent events.

(2) Find x , if $\binom{10}{3} + 2\binom{10}{4} + \binom{10}{5} = \binom{12}{x}$.

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

(1) How many numbers can be formed by using all the digits of the number 2,5,7,8,9 ? How many way of these numbers are ?

(2) In one urn there are 3 red and 2 black balls, in second urn there are 4 red and 1 black balls and in the third urn there are 2 red and 3 black balls. An urn is selected at random and a ball is drawn at random from it. Find the probability that the ball is red.

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

(1) Words using all the letters of the word MAULI are formed. If all these words so formed are arranged in the order of dictionary, what will be the order of the word MAULI ?

(2) In a factory there are three machines and they produced respectively 200, 300 and 500 units of an item daily. The proportions defectives of these machines are 2%, 4% and 3% respectively. An item is taken at random from the day's production and it is found to be defective. Find the probability that the item is produced by

(i) second machine

(ii) third machine.

2 (a) Give the answer of following questions : 4

- (1) The probability density function $f(x)$ cannot exceed ____.
- (2) If $E(3x \pm 2)$ then equal to ____.
- (3) The third moment about mean measures ____.
- (4) If $\beta_2 > 3$; $\gamma_2 > 0$ then curve is known as ____.

(b) Write any one : 2

- (1) Define Mathematical Expectation and also write any three properties of it.
- (2) There are 10 electric bulbs in a box in which 3 are defective bulbs. If 3 bulbs are selected at random from the box, find the expected number of defective bulbs.

(c) Write any one : 3

- (1) If $X_1, X_2, X_3, \dots, X_n$ be n random variables then

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

- (2) Obtain relation between r^{th} central moment and r^{th} 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) $\bar{x} = a + t$

(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 questions : 4

(1) For Binomial distribution $\mu_1' = \underline{\hspace{2cm}}$ and $\mu_2 = \underline{\hspace{2cm}}$.

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

(3) If $x_1 \sim B(p, n_1)$ and $x_2 \sim B(p, n_2)$ two independent Binomial variates then $x_1 + x_2 \sim \underline{\hspace{2cm}}$.

(4) If Binomial distribution function is

$$p(x) = \binom{16}{x} \left(\frac{1}{4}\right)^x \left(\frac{3}{4}\right)^{16-x} \text{ then variance are } \underline{\hspace{2cm}}.$$

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

(1) Obtain mean and variance of Bernoulli distribution.

(2) The mean and variance of a Binomial distribution are 4 and 2.4 respectively. Find its parameters and write down its probability density function.

(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 $k_{(r+1)} = pq \frac{dk_r}{dp}$.

4 (a) Give the answer of following questions : 4

- (1) In Poisson distribution mean _____ variance.
(2) The central moment generating function (c.m.g.f.) of

Poisson distribution $e^{\lambda(e^t - 1)}$.

- (3) If Poisson distribution $p(x) = \frac{e^{-4} 4^x}{x!}; x = 0, 1, 2, \dots$

then standard deviation is _____.

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

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

- (1) The probability that a patient will get reaction of a particular injection is 0.001. Two thousand patients are given that injection. Find the probability that more than two patients will get reaction.

- (2) For Poisson variate x , $P(x=1) = P(x=2)$.

Prove that $P(x=4) = \frac{2}{3}e^{-2}$.

(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

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

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

5 (a) Give the answer of following questions : 4

- (1) The probability of a success changes from trial to trial in _____.
- (2) Negative Binomial distribution $NB(r, p)$ reduces to Geometric distribution when _____.
- (3) In case of Geometric variate x , the variance of x is always _____ mean of x .
- (4) If x is a normal variable with mean $\mu = 50$ and variance $\sigma^2 = 10$, then $P(x > 50)$ is _____.

(b) Write any one : 2

- (1) Find mean of Hyper Geometric distribution.
- (2) The probability that a person can hit a target is 0.7. Find the probability that he will hit the target first time at the fourth trial.

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

- (1) Obtain moment generating function of Geometric distribution and find its mean and variance.
- (2) A person draws a card one after the other from a pack of 52 cards. Each time the card is replaced before the next draw. Find the probability that he will get 3rd spade at the 8th draw. Also find the mean and variance of the number of failures before the 3rd spade is drawn.

(d) Write any one :

5

- (1) Show that Hyper Geometric distribution is approximation to Binomial distribution.
 - (2) In a normal distribution 33% of the observations are less than 45 and 8% are more than 64. Find mean and standard deviation of the distribution.
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