JAG-003-001322   Seat No. _____

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

November - 2019

Statistics : S-301

[Old Course]

Faculty Code : 003
Subject Code : 001322

Time : **2.30** Hours]   [Total Marks : **70**

Instructions :

(1) Q. 1 is 20 marks, Q. 2 and Q. 3 are 25 marks each.

(2) **Right** side figures show the marks of that question.

(3) Students can use their own scientific calculator.

(4) Statistical table provided to student on their request.

1   Filling the blanks and short questions : (each 1 mark)   **20**

(1) If $^{12}C_{(n+3)} = {}^{12}C_{(n+5)}$, then value of n is _____.

(2) _____ districts words can be formed by using all the letters of the BOOk.

(3) Two events are mutually exclusive if there is _____ in between them.

(4) Mathematical probability cannot be calculated if the outcomes are _____.

(5) Two events A and B are equal if _____ and _____.

(6) The probability based on the concept of relative frequency is called _____ or _____.

(7) Probability of the sample space Ω is equal to _____.

(8) If $B \subset A$, the relation between $P(A)$ and $P(B)$ is _____.

(9) If A and B are two events, the $P(A \cap \bar{B})$ is _____.

(10) If $P(A) = p_1$, $P(B) = p_2$ and $P(A \cap B) = p_3$, then

$P(\bar{A} \cup \bar{B}) =$ _____.

(11) A discrete variable can take a finite number of values within its range.

(12) If the probability density function (p.d.f.) of a variable x is defined as, $f(x) = cx(2-x);\ 0 \le x < 2$.

Then the value of $c =$ _____.

(13) The second moment about mean measures _____.

(14) If $\mu_3 = 0$, then given distribution is _____.

(15) If $\beta_2 < 3;\ \gamma_2 < 0$, then curve is known as _____.

(16) If $p < \dfrac{1}{2}$, then Binomial distribution is _____.

(17) If Binomial distribution function is

$$p(x) = {}^6C_x \left(\frac{1}{2}\right)^x \left(\frac{1}{2}\right)^{6-x}, \text{ then mean is } \_\_\_\_.$$

(18) If Poisson distribution $p(x) = \dfrac{e^{-4} 4^x}{x!}; \; x = 0,1,2,........,$ then

variance is ____.

(19) In a police control room there are on an average 3 calls per 10 minutes interval. The probability of receiving 4 calls in a 10 minutes interval is _____.

(20) The mode of normal distribution is 60 with S.D. 10, and then its median is ____.

2 (a) Write the answer any **three** : (Each 2 marks)   6

(1) Define equally events with example.

(2) Prove that $P(A' \cap B) = P(B) - P(A \cap B)$ for any two events A and B.

(3) Define Bernoulli distribution and write its mean and variance.

(4) Obtain moment generating function of negative binomial distribution.

(5) Prove that ${}^{n-2}C_{r-2} + 2\left({}^{n-2}C_{r-1}\right) + {}^{n-2}C_r = {}^nC_r$.

(6) 50% of mangoes are sweet in a lot. Find the probability that first sweet mango will get when third mango is tasted.

(b) Write the answer any **three** : (Each 3 marks)   9

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

   (2) Obtain relation between r^{th} central moment and r^{th} raw moment. Also obtain relation between first four central moment and raw moment.

   (3) Obtain moment generating function of Binomial distribution. Also obtain mean and variance of Binomial distribution from it.

   (4) Define Hyper Geometric distribution and also find its mean.

   (5) A machine is made of 2 parts A and B the probability that part A is defective is 0.05 and the probability that part B is defective is 0.07. Find the probability that the entire machine is not defective.

   (6) The probability that a person hit a target is 0.6. He is to be give a prize when he hits the target for the 4th time. Find the probability that he will be requiring more than 8 trials to obtain the prize.

(c) Write the answer any **two** : (Each 5 marks)   10

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

   (2) For Poisson distribution prove that

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

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

(4) Using Poisson distribution, find the expected frequencies for the following data ($e^{-0.5} = 06.6065$).

No. of accidents	0	1	2	3	4
No. of days	122	60	15	2	1

(5) The daily profit of a business man is Rs. 120 and the S.D. of the profit is Rs. 15. Find the number of days out of 365 days on which his profit will be less than Rs. 100.

3 (a) Write the answer any **three** : (Each 2 marks)   6

(1) Define mutually exclusive events with example.

(2) If A and B are any two events (subset of sample space S) and are not disjoint, then prove that

$$P(A \cup B) = P(A) + P(B) - P(A \cap B).$$

(3) Define mathematical expectation and also write any three properties of it.

(4) Obtain moment generating function of Geometric distribution.

(5) If $^{12}C_5 + 2\left(^{12}C_4\right) + {}^{12}C_3 = {}^{14}C_x$, then find the value of x.

(6) The probability getting head when a coin is tossed 0.5. Find the probability of obtaining head at third trial.

(b) Write the answer any **three** : (Each 3 marks)   9

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

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

   (3) Obtain moment generating function of Negative Binomial distribution. Also obtain mean and variance of Negative Binomial distribution from it.

   (4) Obtain central moment generating function of Poisson distribution. Also obtain first four central moment form it.

   (5) A die is thrown and getting 5 is regarded as success. Find the probability that more than 4 trial will be required before getting first success.

   (6) For Binomial distribution $n = 10$ and

   $9p(x = 5) = 2p(x = 4)$, find value of parameter p.

   Also find mean and variance.

(c) Write the answer any **two** : (each 5 marks)   10

   (1) For Binomial distribution prove that

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

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

(3) A car is parked among N cars in a row, not at either end. On his return the owner finds that exactly r of the N places are still occupied. What is the probability that both neighboring place are empty ?

(4) The probability that a patient will get reaction of a particular injection is 0.001. 2000 patients are given that injection. Find the probability that

(i)   3 patient will get reaction

(ii) more than 2 patients will get reaction.

(5) The average marks of 400 students in statistics is 52 and s.d. of the marks is 8. If

(i)   the standard of passing is of 40 marks,

(ii) the students securing marks between 48 and 60 are given second class,

(iii) at least 66 marks are necessary for getting distinction.

Find the number of students failing in the examination, getting second class and getting distinction.

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