MAT-003-001322 Seat No. ________

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

October / November – 2016

Statistics : P-301
(Elective-I)

Faculty Code : 003
Subject Code : 001322

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

1 Fill in the blanks and short questions : (Each **1** mark) **20**

(1) If $4\times{}^{n}P_{3}=5\times{}^{(n-1)}P_{3}$ then value $n=$______.

(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) Classical probability is not calculable if the _______ number of outcomes is not countable.

(5) In statistical probability n is never _______.

(6) Probability can never be less than _______.

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

(8) Addition theorem will be applicable only when the various events belong to the _____.

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

(10) If $P(A)=p_1, P(B)=p_2$ and $P(A\cap B)$ = p_3, then $p(\bar{A}\cup B)$ = _______.

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

(12) The turning up of spots, 1,2,3,4,5 and 6 in rolling of a die are _____ and ______ events.

(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 $p > \frac{1}{2}$ then Binomial distribution is ______.

(17) If Binomial distribution function is $p(x) = \binom{9}{x}\left(\frac{1}{3}\right)^x \left(\frac{2}{3}\right)^{9-x}$

then variance are ______.

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

(19) The moment generating function (m.g.f.) of Geometric distribution is ________.

(20) 5th decile of a normal distribution is 120, and then its mean will be _____.

2 (a) Write the answer of 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.

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

(5) Prove that ${}^nC_r + {}^nC_{(r-1)} = {}^{(n+1)}C_r$.

(6) A random variable x follows Poisson distribution such that $p(x=k) = p(x+1)$. Find its mean and variance.

(b) Write the answer of 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) The probability distribution of random variable x is as follows. Find the value (i) p (ii) $E(x)$ (iii) $V(x)$ (iv) $E(5x+6)$ (v) $V(2x-9)$.

x	0	1	2	3	4
$P(x)$	$\frac{1}{16}$	p	$\frac{3}{8}$	p	$\frac{1}{16}$

(6) The probability that a person can hit a target is 0.6. He is to be given a price when he hits target for fourth time. Find the probability that he will require more than 8 trails to get the price.

(c) Write the answer of 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) Prove that Poisson distribution is limiting case of the Binomial distribution.

(4) In a random distribution 31% of the items are under 45 and 8% are over 64. Find the mean and standard devaition of the distribution.

(5) What is the probability that at least two out of n people have the same birthday ? Assume 365 days in a year and that all days are equally likely.

3 (a) Write the answer of 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) The mean and variance of a Binomial distribution are 15 and 6 respectively. Find the value of n and p.

(6) 80% of bulbs are defective. Find the probability that first non-defective bulb will be get on testing on 10^{th} bulb. Also find mean and variance.

(b) Write the answer of 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 $X_1, X_2, X_3, \ldots\ldots, X_n$ be n random variables then

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

(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) Clubs contain 50 members. 20 are men and 30 are female. A committee of 10 members is chosen at random. Then find the probability that (i) there is one woman in the committee (ii) the committee members are all women.

(6) The chance of living husband who is now 35 years old till he is 75 are 8:6 and wife now 32 years old living till he is 72 years is 4:5. Find the probability that at least one of them would be died before completing next 40 years.

(c) Write the answer of 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

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

(3) Obtain cumulant generating function for Poisson distribution.

From it prove that $\mu_4 = 3m^2 + m$.

(4) A manufacturer who produce medicine bottles, find that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contain :

(i) no defective bottle (ii) at least two defectives bottles.

(5) A five figure numbers is formed by the digits 0,1,2,3,4 (without repetition). Find the probability that the number formed is divisible by 4.