



**HCV-003-1013018**

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

**October/November - 2017**

**Statistics : S-301**

**(New Course)**

**Faculty Code : 003**

**Subject Code : 1013018**

Time :  $2\frac{1}{2}$  Hours]

[Total Marks : 70

- Instructions :** (1) Each question carry equal marks.  
(2) Students can use their own scientific calculator.

1 (a) Give the answer of following question 4

(1) If  $\binom{12}{n+3} = \binom{12}{n+5}$  then value of \_\_\_\_\_.

(2) \_\_\_\_\_ districts words can be formed by using all the letters of the BOOK

(3) Probability can vary from \_\_\_\_\_

(4) If  $4 \times {}_n P_3 = 5 \times (n - 1)P_3$  then value  $n =$  \_\_\_\_\_.

(b) Write any one 2

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

2. How many different words can be formed by using all letters of the word MISSISSIPPI ?

(c) Write any one : 3

(1) In a bag 6 red and some white balls. From the bag 2 red balls selected randomly whose probability is

$\frac{1}{3}$  then find number of white balls in a bag.

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

(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) Investigation of 300 students about selection of science or other subject which information are as follow :

Student	Subject		Total
	Science	Other	
Boys	120	80	200
Girls	60	40	100
Total	180	120	300

Find :

- (i) the probability of students who select science subject.  
(ii) the probability of boy student who select science subject.  
(iii) the probability of girl student who select other subject.

2 (a) Give the answer of following question :

4

- (1) If a discrete random variable has the probability function as,

$x$	0	1	2	3	4	5	6	7	8
$p(x)$	$k$	$2k$	$3k$	$5k$	$5k$	$4k$	$3k$	$2k$	$k$

then the value of  $k$  is equal to  $\frac{1}{26}$  and  $E(x) = \underline{\hspace{2cm}}$ .

- (2)  $V(2x \pm 3) = \underline{\hspace{2cm}}$ .

- (3) The first moment about mean is always  $\underline{\hspace{2cm}}$ .

(4) The relation between 2<sup>nd</sup> central moment and 2<sup>nd</sup> raw moment is  $\mu_2 = \underline{\hspace{2cm}}$ .

(b) Write any one

(1) If  $X$  and  $Y$  are two independent continuous random variables then prove that  $E(XY) = E(X)E(Y)$  provided all the expectations exist. 2

(2) If  $\mu_1' = 2, \mu_2' = 20$  and  $\mu_3' = 40$  obtain from 5, then prove that Mean = 7, Variance = 16 and  $\mu_3 = -64$

(c) Write any one 3

(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  $\mu_4 = k_4 + 3k_2^2$

(d) Write any one : 5

(1) Obtain relation between  $r^{\text{th}}$  central moment and  $r^{\text{th}}$  raw moment. Also obtain relation between first four central moment and raw moment.

(2) The probability distribution of a random variable is as follows :

$x_i$	0	1	2	3	4	5
$p(x_i)$	$k$	0.2	0.1	$k$	0.05	0.05

Find :

(i)  $k$

(ii)  $E(x + 3)$

(iii)  $V(2x - 3)$

3 (a) Give the answer of following question 4

(1) The mean of Binomial distribution is \_\_\_\_\_ and its variance is \_\_\_\_\_.

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

(3) In Bernoulli distribution mean \_\_\_\_\_ variance.

(4) If Binomial distribution function is

$$p(x) = \binom{6}{x} \left(\frac{1}{2}\right)^x \left(\frac{1}{2}\right)^{6-x} \text{ then mean are } \underline{\hspace{2cm}}.$$

(b) Write any one : 2

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

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

(c) Write any one 3

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

(2) A person tosses three coins simultaneously. He gets Rs. 8 if three heads appear, Rs. 4 if two heads appear and Rs. 2 if one head appears. What penalty should be charged if no head appear in order that game is fair ?

(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) The probability that a bomb dropped from a plane will hit a target is  $\frac{2}{5}$ . Two bombs are enough to destroy a bridge. If 4 bombs are dropped on a bridge, find the probabilities that (i) the bridge will be destroyed (ii) the bridge will be partially destroyed (iii) the bridge will be saved.

4 (a) Give the answer of following question 4

- (1) In Poisson distribution mean \_\_\_\_\_ variance.
- (2) The moment generating function (m.g.f) of Poisson distribution is \_\_\_\_\_.
- (3) For Poisson distribution, if  $p(0) = p(1)$ , then the value of  $\lambda$  is \_\_\_\_\_.
- (4) In a police control room there are on an average 3 calls per 10 minute interval. The probability of receiving 4 calls in a 10 minute interval is \_\_\_\_\_.

(b) Write any one 2

1. For a Poisson variate  $3P(x = 2) = P(x = 4)$ . Find mean and standard deviation.
2. on an average 1.5 percent of electric bulbs are found to be defective in a bulb manufacturing factory. Using Poisson distribution find the probability of 4 defective bulbs in a box of 200 bulbs. ( $e^{-3} = 0.0498$ ).

(c) Write any one 3

- (1) Prove that Poisson distribution is limiting case of the Binomial distribution.
- (2) A random variable  $x$  follows Poisson law such that  $P(x = k) = P(x = k + 1)$ . Find its mean and variance.

(d) Write any one 5

- (1) There are 100 misprints in a book of 100 pages. If a page is selected at random, find the probabilities that (i) there will be no misprint in the page (ii) there will be one misprint (iii) there will be at most two misprints. [ $e^{-1} = 0.3679$ ]
- (2) For Poisson distribution prove that

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

5 (a) Give the answer of following question 4

- (1) In Negative Binomial distribution mean \_\_\_\_\_ variance.
- (2) The mean and variance of the Geometric \_\_\_\_\_ distribution are \_\_\_\_\_ and \_\_\_\_\_ respectively
- (3) If  $X \sim N(\mu, \sigma)$  the standard normal deviate is distribution as \_\_\_\_\_
- (4) Within  $3\sigma$  limits, the area under a normal curve is \_\_\_\_\_.

(b) Write any one 2

- (1) Obtain moment generating function of Geometric distribution.
- (2) \_\_\_\_\_ Obtain moment generating function of Negative Binomial distribution.

(c) Write any one : 3

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

- (2) 80 percent of mangoes are sweet in a lot. The quality of the mango can be judged only by its taste. A person needs 5 sweet mangoes. Find the probability that he will get 5<sup>th</sup> sweet mango when he tastes 8<sup>th</sup> mango.

(d) Write any one :

5

- (1) The average marks of 400 students in Statistics is 52 and s.d. of the marks is 8. If (1) the standard of passing is of 40 marks, (2) the students securing marks between 48 and 60 are given second class, (3) at least 66 marks are necessary for getting distinction. Find the number of students failing in the examination, getting second class and getting distinction.
- (2) A die is thrown and getting 5 is regarded as success. Find the probability that more than 4 trials will be required before getting first success.

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