

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)  
BSc DEGREE EXAMINATION MAY 2017  
(Sixth Semester)

Branch - MATHEMATICS WITH COMPUTER APPLICATIONS

CORE ELECTIVE - II MATHEMATICAL STATISTICS

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10x2 = 20)

- 1 State Boole's inequality.
- 2 Define Pair wise independent events.
- 3 If  $P(x) = \begin{cases} x = 1,2,3,4,5 \\ 0, \text{ else where} \end{cases}$  find  $P \left( \frac{1}{2} < x < \frac{1}{2} \right)$
- 4 State any two properties of a continuous distribution function  $F(x)$ .
- 5 Prove that  $\text{Cov}(x, y) = E(xy) - E(x)E(y)$ .
- 6 State the multiplication theorem of expectation.
- 7 Ten coins are thrown simultaneously. Find the probability of getting at least seven heads.
- 8 Find the moment generating function of the Poisson distribution.
- 9 Write any two applications of  $t$ -distribution.
- 10 Write the formula of  $t$ -test for difference of means.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks ( 5 x 5 = 25)

- 11 a For any three events A, B and C prove:  
 $P(A \cup B | C) = P(A | C) + P(B | C) - P(A \cap B | C)$ .  
OR  
b State and prove Baye's theorem.
- 12 a A continuous random variable X has a p.d.f  $f(x) = 3x^2, 0 < x < 1$ . Find a and b such that (i)  $P(x < a) = P(x > a)$  (ii)  $P(x > b) = 0.05$ .  
OR  
b Verify that the following is a distribution function:  
$$F(x) = \begin{cases} 0, & x < -a \\ \frac{1}{2} \left( \frac{x}{a} + 1 \right), & -a < x < a \\ 1, & x > a \end{cases}$$
- 13 a Let X be a random variable with the following probability distribution:  

x	-3	6	9
P(X = x)	1/6	1/2	1/3

Find  $E(x)$ ,  $E(x^2)$  and  $E(2x+1)^2$ .  
OR  
b A coins is tossed until a head appears. What is the expectation of the number of tosses required?

Cont ...

- 14 a Find the mean and variance of the Poisson distribution.  
OR  
b Discuss about the normal distribution.
- 15 a A random sample of 10 boys had the following I. Q's 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do these data support the assumption of a population mean I.Q of 100?  
OR  
b In one sample of 8 observations, the sum of squares of deviations of the sample values from the sample mean was 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5% level, given that the 5% point of F for  $n_1 = 7$  and  $n_2 = 9$  degrees of freedom is 3.29.

**SECTION - C (30 Marks)**

Answer any THREE Questions

ALL Questions Carry EQUAL Marks (3 x 10 = 30)

- 16 The contents of urns I, II and III are as follows:  
1 white, 2 black and 3 red balls  
2 white, 1 black and 1 red balls and  
4 white, 5 black and 3 red balls  
One urn is chosen at random and two balls are drawn from it. They happen to be white and red. What is the probability that they come from Urns I, II or III?
- 17 In a continuous distribution whose relative frequency density is given by  $f(x) = kx(2-x)$ ,  $0 < x < 2$ , find mean, variance,  $P_1$  and  $p_2$ .
- 18 Two random variables X and Y have the following joint probability density function:  
,, ,  $[2-x-y; 0 < x < 1, 0 < y < 1$   
 $f(x,y) = \begin{cases} 0, & \text{otherwise} \end{cases}$   
Find (i) Marginal probability density function of X and Y  
(ii) Conditional density functions  
(iii) Var (X) and Var(Y)  
(iv) Covariance between X and Y.
- 19 Fit a Poisson distribution to the following data:
- | Number of mistakes per page : | 0   | 1  | 2  | 3 | 4 | Total |
|-------------------------------|-----|----|----|---|---|-------|
| Number of pages:              | 109 | 65 | 22 | 3 | 1 | 200   |
- 20 Discuss about t-test.

**Z-Z-Z**

END