B. Sc DEGREE END SEMESTER EXAMINATION – MARCH/APRIL 2018

SEMESTER – 2: STATISTICS FOR B.Sc. MATHEMATICS / B.Sc. COMPUTER APPLICATIONS

COURSE: **15U2CPSAT2 – 15U2CRCST2: PROBABILITY AND STATISTICS**

(Common for Regular 2017 / Supplementary - Improvement 2016 / 2015 Admission)

Time: Three Hours   Max. Marks: 75

Use of Scientific calculators and Statistical tables permitted

PART - A

*Answer **all** questions. Each question carries 1 mark.*

1. Mutually exclusive events are independent events. Do you agree?
2. Who introduced classical definition of probability?
3. Give the simplest expression of $(A \cap B) \cup (A \cap B^c)$.
4. If f(x) = k (x+2) for   x = 1, 2, 3, 4, 5 is a probability mass function (p.d.f.), find k.
5. If the distribution function of a non-negative random variable X is F(x) then write down the value of F(0).
6. Determine k so that f(x, y) = k (2x+3y); 0<x<1, 0<y<1 and 0 elsewhere is a probability density function.
7. If X and Y are independent random variables then what can you say about their conditional distributions.
8. If the regression coefficients of a bivariate data are -1.6 and -0.4 respectively, find the correlation coefficient between the variables.
9. Define partial correlation.
10. Eighty-one percent of the total variation in y is explained by the linear regression y on x. What is the coefficient of correlation?   (1 x 10 = 10)

PART - B

(Each question carries **three** marks. Maximum marks from this part is **15**)

11. A family was randomly chosen from a set of families having four children. What is the probability that there will be at least one boy, assuming that boys and girls are equally likely?
12. Two balls are randomly drawn with replacement from an urn containing ten balls numbered 1,2,…,10. Calculate the probability of the event that the sum of the values on the two balls drawn is odd.
13. If X follows a uniform distribution in [-3, 3], find the probability density function of $Y=X^2$.
14. The p.d.f. of a r.v. X is given by $f(x) = (1/\sqrt{2\pi})e^{-(x^2/2)}$ for $-\infty< x <\infty$ Find the p.d.f. of $Y = |X|$.
15. If $(x, y) = \frac{1}{8}(6 - x - y)$ for 0 < x < 2, 2 < y < 4 and 0 elsewhere is the joint p.d.f. of (X,Y), find P (X <1|Y < 3).
16. Find the probable error if r=0.526, n=50. Comment on the value of r.
17. Why there are two regression equations in the case of a bivariate data?

PART - C
(Each question carries **five** marks. Maximum marks from this part is **20**)

18. State and prove Baye's theorem.
19. A certain product was found to have two types of minor defects. Suppose the probability that a randomly chosen item has only a type1 defect is 0.2 and the probability that it was only a type 2 defect is 0.3. Also, the probability that it has both defects is 0.1. Find the probability that a randomly chosen item does not have either of the defects.
20. Find the distribution function of the total number of heads obtained in four tosses of an unbiased coin.
21. The p.d.f.of life length of a certain item is given by f (x) = $\theta\, e^{-\theta x}$ for x ≥ 0 and θ ≥ 0. Show that the item has a constant failure rate.
22. If f(x,y) = 24y(1-x-y) for x > 0, y > 0, x + y < 1 and 0 elsewhere is the joint p.d.f. of (X,Y), examine whether X and Y are independent.
23. What do you mean by multiple correlation? Derive an expression for the same when there are only three variables.

PART - D
(Each question carries **ten** marks. Maximum marks from this part is **30**)

24. Define Borel field of events. State and prove the addition theorem in the case of three events.
25. If f (x,y) = $\frac{1}{25}\left(\frac{20-x}{x}\right)$ for 10 < x < 20, $\frac{x}{2}$ < y < x and 0 elsewhere is the joint p.d.f. of (X,Y), find the marginal densities. Also find the conditional density of Y given X = 12.
26. What do you mean by rank correlation? Derive the formula for Spearman's rank correlation.
27. A company wanted to assess the impact of R and D expenditure (X) on annual profit (Y) based on the following data for past 8 years.

   X: 9   7   5   10   4   5   3   2
   Y: 45   42   41   60   30   34   25   20

   Find the regression equation Y on X. Estimate the profit for R and D expenditure of 8 lakhs.

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