33

N17286 (Pages : 2) Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Statistics Degree Examination, November 2017

BSTA1B01 – Basic Statistics & Probability

(2017 Admission onwards)

Time: 3 hours Max. Marks : 80

Part A

(Answer all questions; each question carries 1 mark)

Fill in the blanks (Questions 1-7)

1. Family size is a continuous variable: .....(True/False)
2. If the arithmetic mean and standard deviation of a give frequency distribution are equal, then the coefficient of variation is .....
3. If the Karl Pearson's correlation coefficient of two variables X and Y is 0.1, then the correlation coefficient of 2X and 2Y is .....
4. The number of normal equations associated with the problem of fitting a parabola is ...
5. In a random experiment of tossing of a coin and a die, the sample space is S = ...
6. If A and B are two disjoint events, then $P(A \cap B)$ = ...
7. If f(x) is a probability density function, then $\int_{-\infty}^{+\infty} f(x)dx = \cdots$

Multiple Choice Questions (Questions 8-12)

8. Which among the following is most suitable for comparing dispersion between two sets of data?
   (a) Coefficient of variation (b) Range (c) Mean Deviation (d) Standard Deviation
9. For a given random variable X, if $P(X \leq 4) = 0.6$, then $P(X > 4)$ is
   (a) -0.6 (b) 0.3 (c) 0.4 (d) None of these.
10. The equation Y = a + bX, where a and b are real numbers and X and Y are variables is usually known as
    (a) Straight line (b) Parabola (c) Cubic equation (d) Exponential equation
11. If the average birth weight of a new born child is 3 Kg., then, Pr(weight of a new born child=3Kg) is
    (a) 0 (b) 1 (c) 0.5 (d) more than 0.5
12. If A and B are two events such that P(AUB) = 0.7, P(A) = 0.5 and P(B) = 0.4, then $P(A \cap B)$ is
    (a) 0.2 (b) 1.2 (c) 0.9 (d) 0.1

(12x1=12 Marks)

Part B

(Answer any seven questions; each question carries 2 marks)

13. Mention any four merits of arithmetic mean
14. Define skewness and suggest any one formula for measuring the same.
15. Define Spearman's rank correlation coefficient.
16. Define multiple correlation and give the formula of multiple correlation coefficient in the case of three variables.
17. Define (i) mutually exclusive events and (ii) equally likely events
18. Give the statistical definition of probability.
19. Give any two properties of cumulative distribution function.
20. Define mutual independence of events.

21. Let X be a continuous random variable with probability density function

$$f(x) = k, \quad -1 \le x \le 1$$
$$0, \quad otherwise.$$

Determine k.

(7x2=14 Marks)

Part C

(Answer any six questions; each question carries 5 marks)

22. The means of two samples of size 50 each are 10 and 12 and the standard deviations are 5 and 6. Obtain the combined mean and standard deviation.
23. The first three moments about origin of a distribution are 1, 2 and 3 respectively. Obtain (i) mean (ii) standard deviation (iii) β_1, the coefficient of skewness.
24. Fit a straight line to the following data.

X	1	2	3	4	5
Y	5	7	9	10	14

25. Find the partial correlation coefficient $r_{12.3}$ and multiple correlation coefficient $R_{1.23}$, given $r_{12} = 0.77$, $r_{13} = 0.72$ and $r_{23} = 0.52$
26. State and prove the addition theorem of probability.
27. Three urns are given, each containing red and white chips as indicated below:
    Urn 1: 6 red and 4 white
    Urn 2: 2 red and 6 white
    Urn 3: 1 red and 8 white
    An urn is chosen at random and a ball is drawn from this urn. The ball is red. Find the probability that the urn chosen was urn 1.
28. The following is the probability mass function of a discrete random variable X:

x	-3	-1	0	1	2	3	5	8
p(x)	0.1	0.2	0.15	0.2	0.1	0.15	0.05	0.05

    Find (i) The cumulative distribution function of X (ii) P(1<X<8) and (iii) P(X>3/X>0)
29. The p.d.f. of a continuous random variable X is:
    f(x) = 1/3 , 0 < x < 3. Find the p.d.f. of $Y = X^2$

(6 x 5=30 Marks)

Part D

(Answer any three questions; each question carries 8 marks)

30. Explain the various measures of central tendency.
31. Calculate Pearson's correlation coefficient and Spearman's rank correlation coefficient for the following data.

X	10	15	12	17	13
Y	30	42	45	46	33

32. (i) Discuss the classical definition of probability and mention any two limitations of it.
    (ii) Two unbiased dice are thrown. Give the sample space and find the probability that both the dice show the same number.
33. (i) Give the axiomatic definition of probability
    (ii) State and prove Bayes' theorem
34. A continuous random variable X has the following p.d.f.:
    $f(x) = \frac{1}{20} e^{-x/20}$, x >0.

    Find (i) P(X < 10) (ii) P(16 < X < 24) and (iii) P (X > 30)

(3 x 8= 24Marks)

34

2B1N17287 (Pages : 2) Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Mathematics Degree Examination, November 2017

BSTA1C01 – Basic Statistics & Probability

(2017 Admission onwards)

Max. Time: 3 hours Max. Marks : 80

Part A

Answer all questions each question carries one mark

Multiple Choice questions

1 Geometric mean is a good measure of central tendency if the data are
a) Categorical b) on ordinal scale
c) in ratios and proportions d) none of these

2 In a discrete series having 2k+1 observations median is
a) k^{th}observation b) $(k+1)^{th}$ observation
c) $(k+2)/2^{th}$ observation d) $(2k+1)/2^{th}$ observation

3 If all values in a sample are same their variance is
a) zero b)one c)not calculable d) all the above

4 If $\rho_{xy}=0$ the variables X and Y are
a) Linearly related b) independent
c)Not linearly related d) none of the above.

5 If B C A, P(A/B) is equal to
a)zero b)one c)P(A)/P(B) d) P(B)/P(A)

Fill in the blanks

6 The arithmetic mean of a certain values is 9, and their GM is 6. Then their HM is .....

7 The sum absolute deviations of a set observation taken from ..... is minimum.

8 ..... and ..... are least affected by extreme values as a measure of central tendency.

9 The standard deviation of the first n natural numbers is .....

10 If a constant value 5 is subtracted from each variate value of X and Y, the value of the regression coefficient will .....

11 The turning up of spots 1,2,...6 in rolloing a die are ..... and .....

12 Addition theorem of probability will be applicable only when the various events belong o the .....

(12x1=12 Marks)

PART B

Answer any seven questions each question carries two marks

13 The mean and standard deviation of a set of values are 25 and 5 respectively. If a. constant value 5 is added to each value, what is CV of the new set of values

14 What would be the weighted AM of the first **n** natural numbers, if the weights are the corresponding numbers

15 How can the variance of the combined set of two series be computed?

16 What do you understand by kurtosis, how can it be measured.

17 What are the important properties of regression coefficients, write any two.

18 If two events A and B are mutually exclusive, P(A) =1/3 , P(B) = ½ what is the probability that neither A nor B will happen.

19 State multiplication theorem of probability for three events A,B and C.

20 What are the axioms of probability

21 State statistical definition of probability.

(7x2=14 Marks)

PART C

Answer any six questions each question carries five marks

22 Show that mean deviation observations about their median is minimum.

23 Show that $-1 \leq r_{xy} \leq 1$, where r_{xy} is pearsons correlation coefficient.

24 Calculate mean and mode for the following distribution

value	0-10	0-20	0-30	0-40	0-50	0-60	0-70	0-80
frequency	4	18	38	89	121	138	144	148

25 Explain the principle of least squares, how will you use it to fit a linear regression of y on x , Given n pairs of values (x_i ,yi) for i=1,2,...n.

26 You are given the following data

	x	y
Arithmetic mean	36	85
Standard deviation	11	8

Correlation coefficient between X and y is 0.66

a)Find the two regression equations b) Estimsate the value of X when Y=75

27 Define conditional probability function and show that it satisfy all axioms of Proba

28 State and prove addition and multiplication theorem of probability.

29 98 percentage of all babies survive delivery, however 15 percent of all births involv Cesarean (C) section, and when a C section is performed the baby survive 96 percent of the time. If a randomly chosen pregnant woman does not have a C section, what is the probability that her baby survives.

(6x5=30Mark

PART D

Answer any three questions each question carries eight marks

30 A pair of fair dice thrown, Let X be the r.v defined by number of sixes occur. Obta 1) probability distribution of X 2) Distribution function of X 3) sketch its graph

31 a) A continuous r.v X has probability density function $f(x) = Ae^{\frac{-x}{5}}$ for x>0, and and 0 elswhere,

1) find A.

2) Show that for any two positive numbers s and t P(x>s+t/X>s) = P(x>t)

b) Let X be a r.v with pdf $f(x) = \frac{x}{4}$ if -1<x<3 and 0 elsewhere, find the probability distribution of the variable $y = 2x - 3$

32 From the following data obtain the two regression equations and correlation Coef

x	5	8	7	6	4
y	3	4	5	2	1

33 Suppose that 5 percent of men and 0.25 percent of women are colourblind. A colo blind person is chosen at random , what is the probability of this person being ma Assume that there are an equal number of males and females.What will be the probability if the population consisted of twice as many males as females.

34 Define coefficient of variation (CV). Among the following two series of observa Identify which series is more consistent.

class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Series A f	1	2	9	8	5	4	1
Series B f	1	3	7	8	7	3	1

(3x8=24 Mark

35

B1N17288 (Pages : 4) Reg. No:.....

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Statistics Degree Examination, November 2017

BASC1C01 – Financial Mathematics

(2017 Admission onwards)

Max. Time: 3 hours Max. Marks : 80

Part-A

[Answer *all* Questions. Each question carries 1 marks]

1. The maturity value of an Rs.2800 loan for 16 months at 12% simple interest is…

   a) 448 b)3248 c)3768 d)668

2. Find the present value of Rs.5000 due in 12 years at 8% compounded annually.

   a) 2000.51 b) 2221.08 c) 1985.57 d) none of these

3. The accumulated value at time't' of 1 invested at time 0 is denoted by ……

4. Calculate v, assuming an effective annual rate of interest of 5%.

   a)0.8525 b) 0.9524 c)0.6265 d) 0.9395

5. Find the present value of Rs.2479.27 due at the end of $8\frac{1}{2}$ years if money worth 6% compounded semiannually.

   a) 900.2354 b) 920.7127 c) 930.1253 d) none of these

6. The constant nominal rate of interest convertible four monthly is 15% p.a. Calculate the accumulated value after 7 years of a payment of Rs.300

7. When the force of interest is varying continuously, then it is denoted by the symbol …..

8. If i=7%, calculate $d^{(4)}$

9. write down the formula for $\ddot{s}_{n\rceil}^{(p)}$

10. How long will it take for a sum of money to double itself at 10% simple interest?

    i) 2 years ii) 5 years

    iii) 10 years iv) 20 years

State whether True or False

11. The present value is always less than the sum payable at some future date.

12. Commercial rate of discounts are generally used in financial transactions where the period of transaction is greater than a year.

(12x1=12 Marks)

Part-B

[Answer *any* 7 Questions. Each question carries 2 marks]

13. Define effective rate of discount.
14. Define fixed interest security.
15. Calculate $\ddot{a}_{8\urcorner}$ at i=5%.
16. Find the accumulated value, if principal of RS.5000 invested for 15 years at compound interest of 9.3% p.a.
17. Find P, If I=5, R=125, i=10% and n=10.
18. If i=8%.find $(Ia)_{12\urcorner}$
19. Calculate $(Ia)_{10\urcorner}$ at 6% p.a.
20. Prove that $(I\ddot{a})_{\infty\urcorner} = \frac{1}{d^2}$
21. Define fixed interest security.

(7x2=14 Marks)

Part-C

[Answer *any* 6 Questions. Each question carries 5 marks]

22. Derive the expression for present value of an annuity due.
23. Calculate
    i. $a^{(12)}_{3.5\urcorner}$, given that i=19.5618%
    ii. $a^{(4)}_{13.25\urcorner}$, at 10.3813% p.a. effective.
    iii. $6/\ddot{a}^{(2)}_{10\urcorner}$ at 5%p.a. effective.
24. A loan of Rs.5000 is repayable by 36 monthly installments, payable in arrears. The fl rate of interest charged on the loan is 7% p.a.
    a) What is the monthly repayment?
    b) What is the APR on this transaction?
25. Assuming a rate of interest of 8% p.a., calculate the present value as at 1 Jan 2010 of these following annuities payable annually in advance from 1 Jan 2011, initially of Rs. 5000 p.a., and increasing by Rs.400 p.a. subsequent 1 January.
26. Derive an expression for the accumulated value of increasing immediate annuity.
27. Calculate the accumulated value of Rs.6.34, assuming a force of interest of 9% p.a., afte
    i. 3 months
    ii. 3 years
    iii. 7 years and 5 days.

. Define nominal rate of interest and derive the relationship between nominal rate of interest and effective rate of interest.

). The force of interest is:

$$\delta(t) = 0.01t + 0.04, 0 \leq t \leq 5.$$

Find the present value at time 0 of the payment stream $0.5t + 2$, which is received between 0&5.

(6x5=30 Marks)

Part-D

[Answer *any 3* Questions. Each question carries 8 marks]

0. A person takes out a home improvement loan for Rs.125000 over 5 years. He makes monthly repayments in arrears and the bank charges an effective rate of interest of 8% p.a.

a) What is the monthly repayment?

b) How much interest does he pay in the fourth year?

c) How much capital is repaid in the 25^{th} installment?

d) Determine when the amount of the loan outstanding falls below Rs25000.

1. The force of interest δ(t) is a function of time , and at any time t, measured in years, is given by the formula.

$$\delta(t) = \begin{cases} 0.04\,, & 0 < t \leq 8 \\ 0.005t\,, & 8 < t \leq 20 \\ 0.003t + 0.0002t^2, & 20 < t \end{cases}$$

a) Derive expression in terms of t for the accumulated amount at time t of an investment of 1 at time 0.

b) Calculate the value at time 0 of Rs.100 due at time 15.

2. Derive the expression for

i. The accumulated value of an immediate annuity, at the end of n years with annuity payments payable 'p' times in a period.

ii. Present value of a deferred annuity immediate.

3. (a) An annuity payable annually in arrears has a first payment of £300, with subsequent payments decreasing by £10 each year to £110 in the final year. Find an expression for the present value of this annuity. Hence, calculate the present value of the annuity payable at an effective rate of interest of 6% *pa*.

(b) An annuity certain provides payments annually in arrear for 8 years. The first payment is £500, with subsequent payments increasing by 5% *pa* compound. Calculate the present value of this annuity at an effective rate of interest of 8% *pa*.

34. A loan of Rs.5000 is repayable over 5 years by level quarterly installments calcu using a rate of interest of 5% per annum effective.

a) Calculate the amount of each quarterly installment.

b) What is the capital content of the sixth repayment?

c) How much interest is paid in the second year?

d) Determine when the amount of loan outstanding falls below Rs.1000.

(3x8=24 M