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B2M18100 (Pages : 3) Reg. No:…………………………...

Name: …………………………….

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Psychology Degree Examination, March 2018

BSTAT(PSY2)C02 – Psychological Statistics

(2017 Admission onwards)

Max. Time: 3 hours Max. Marks : 80

PART-A

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

1. The correlation coefficient measures the strength of … relationship between two variables.
2. The graphical method of studying correlation is called….
3. If each observation in X and Y series are divided by 10, and if the old correlation is 0.86, the value of the new correlation coefficient is…
4. The formula for covariance is…….
5. If A and B are events which have no points in common, then P(AUB) =
6. The sign of correlation is the same as the sign of…..
7. The regression coefficients are …… by change of origin.
8. The product of regression coefficients is ……….
9. The events with the same chance of occurrence are called…….events.
10. A variable which takes a finite number of values is termed as a…..variable.
11. The formula for P (A/B) is……
12. The formula for rank correlation coefficient is… ….

(12 x 1= 12Marks)

PART-B

Answer any *seven* questions. Each question carries *two* marks.

13. Define mutually exclusive events .Give example.
14. Define a sample space. Give example.
15. What do you mean by conditional probability?
16. What are the uses of scatter diagram?
17. Distinguish between simple correlation and rank correlation.
18. What is meant by principle of least squares?

19. What are the uses of regression?

20. If the sum of squares of the differences between 10 ranks of two series is 33, find the rank correlation coefficient.

21. Explain the concept of multiple regression.

(7 x 2= 14 Marks)

PART-C

Answer any *six* questions. Each question carries *five* marks.

22. From the following two regression equations, find the correlation coefficient and the means of the two series. 8X-10Y+66=0, 40X-18Y-214=0.

23. Two unbiased dice are thrown. Find the probability that the sum of the points scored on the two dice is 8?

24. For the following pairs of values, obtain the rank correlation coefficient.

X	14	26	15	19	26	11	18
Y	61	44	50	57	52	58	44

25. A town has two doctors X and Y working independently. If the probability that X is available is 0.9 and that for Y is 0.8, what is the probability that at least one doctor is available when needed?

26. A box contains 10 white, 5 yellow and 10 black pens. A pen is chosen at random from the box and it is noted that it is not one of the black pens. What is the probability that it is yellow?

27. What are difference between correlation and regression?

28. Define probability mass function and distribution function. What are their important properties?

29. Two coins are tossed. X represents the number of heads. Write down the probability mass function and distribution function of X

(6 x 5= 30 Marks)

PART-D

Answer any *three* questions. Each question carries *eight* marks.

1. Calculate Karl Pearson's coefficient of correlation for the data given below.

X	100	109	112	118	120	123	124	126	128	131
Y	75	73	75	76	76	82	75	83	68	80

. Find the lines of regression X on Y and Y on X from the data given below.

X	3	5	6	6	9
Y	2	3	4	6	5

2. a) Distinguish between partial and multiple correlation.

b) Compute partial correlation coefficients and multiple correlation coefficients for the following data.

$r_{12} = 0.93, r_{13} = 0.94, r_{23} = 0.95$

3. a) Three groups of children contain respectively 3 girls and 1 boy, 2 girls and 2 boys,1 girl and 3 boys. One child is selected at random from each group. Find the chance that there are 2 boys and 1 girl in the selected group.

b) A number is selected at random from 1 to 100. Find the chance that it is either a multiple of 3 or a multiple of 7?

4. a) From the following probability mass function determine k and P(X>0).

X:	-2	-1	0	1	2
P(X=x):	0.1	0.2	0.3	k	0.2

b) Let X be the number of heads obtained when 4 coins are tossed. Write down the probability mass function of X.

(3 x 8= 24 Marks)

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1B2M18106 (Pages : 3) Reg. No:…………………………

Name: …………………………

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Statistics Degree Examination, March 2018

BSTA2B02 – Probability Distributions

(2017 Admission onwards)

Max. Time: 3 hours Max. Marks : 80

Part A

(Answer all questions; each question carries 1 mark)

Fill in the blanks

1. If F(x,y)is the joint distribution function of (X,Y), then $F(x,+\infty) =$ ……………
2. Moment generating function of the standard normal distribution is …………..
3. If X has Bernoulli distribution with $p = \frac{1}{4}$, then V(X) = ………………..
4. The normal distribution is symmetric about …………………..

State true or false

5. Characteristic function of a random variable always exists.
6. If X is a random variable and r is an integer, $E(X^r)$ represents the r^{th} central moment.
7. If X and Y are two independent normal variables, then X – Y is also a normal variable.

Choose the correct answer

8. Joint cdf F(x,y) lies within the values ………………..
   (a) -1 & 1 (b) -1 & 0 (c) $-\infty$ & 0 (d) 0 & 1
9. If V(X) = 1, then V (2X+3) is ……………
   (a) 4 (b) 2 (c) 5 (d) 3
10. If X is and Y are independent Poisson variates such that X ~ P(1) and y ~ P(2), then the mean of the random variable X + Y is …………………..
    (a) 2 (b) 5 (c) 3 (d) 1
11. Standard deviation of the standard exponential distribution is ……………..
    (a) 1 (b) $\frac{1}{4}$ (c) $\frac{1}{2}$ (d) none of these
12. The income of people exceeding a certain limit follows …… distribution.
    (a) gamma (b) log normal (c) uniform (d) pareto

(12x1=12 Marks)

Part B

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

13. Define joint pdf and state its properties..
14. Define conditional mean and variance in the case of continuous variables.
15. If $M_x(t)$ is the mgf of a r.v X, obtain the mgf of $Y = \frac{X-a}{m}$.
16. Define log normal distribution.
17. If μ_r' is the r^{th} moment about the origin of a r.v X and if $\mu_r' = r!$, find the mgf of X.
18. State Lindberg-Levy form of central limit theorem.
19. X is a r.v such that $E(X) = 3$ and $E(X^2) = 13$, use Chebyshev's inequality to determine a lower bound for $P(-2 < X < 8)$.
20. Derive the mgf of the uniform distribution.
21. A coin is tossed until a head appears. Find the expected number of tosses required.

(7x2=14 Marks)

Part C

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

22. State and prove the addition and multiplication theorems on mathematical expectation in the case of two discrete random variables (X,Y).
23. If $f(x) = \begin{matrix} 1+x, & -1 \le x \le 0 \\ 1-x, & 0 \le x \le 1 \end{matrix}$ is the pdf of a r.v X, find the mean and variance.
24. Derive the mode of the Binomial distribution with parameters (n,p).
25. State and prove recurrence formula for finding central moments of Poisson distribution.
26. If X_1 and X_2 are two independent normal variates with parameters (μ_1, σ_1) and (μ_2, σ_2) respectively, obtain the distribution of $X_1 + X_2$.
27. If $X \sim N(\mu, \sigma)$, show that $P(\mu - 2\sigma \le X \le \mu + 2\sigma) = 0.9545$.
28. State and prove weak law of large numbers..
29. If X has uniform distribution in (0,1), find the distribution of $-2\log_e X$. Also identify the distribution.

(6x5=30 Marks)

Part D

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

30. State and prove Chebyshev's inequality. Use it to prove that in 2000 throws with a fair coin, the probability that the number of heads lies between 900 and 1100 is at least $\frac{19}{20}$.

31. In a distribution which is exactly normal, 10.03% items are under 25 kilograms weight and 89.97% of the items are under 70 kilograms weight. What are the mean and standard deviation of the distribution?

32. A two dimensional r.v (X, Y) have a bivariate distribution given by $P(X=x, Y=y) = k\,(2x+y)$, where X and Y assume only integer values 0, 1 and 2.
    i. Find k ii. The conditional distribution of Y for X=x.

33. Define Poisson distribution and obtain its moment generating function. Also Show that under certain conditions (to be stated), the Binomial distribution tends to the Poisson distribution.

34. Derive the mgf of the normal distribution.

(3x8=24 Marks)

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2M18107 (Pages : 3) Reg. No:.............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Statistics Degree Examination, March 2018

BSTA2C02 –Probability Distribution

(2017 Admission onwards)

ax. Time: 3 hours Max. Marks : 80

Part A

Answer all questions. Each question carries one mark.

ultiple Choice questions

If cov(X,Y) = 0 .Then..............

(a)X and Y are independent (b) X and Y are correlated

(c) X and Y are uncorrelated (d)none of the above

E(E(X/Y)) = ...

(a)zero (b)one (c)E(X/Y) (d) E(X)

Binomial distribution is................

(a) positively skewed (b) platy kurtic (c) meso kurtic (d) none of the above

If $X \rightarrow N(\mu,\sigma)$ then fourth central moment of X is..........

(a) σ^4 (b) $2\sigma^4$ (c) $3\sigma^4$ (d) $4\sigma^4$

ill in the Blanks

If F(x) is a distribution function $\lim_{x\to\infty} F(x) =$ ....

If X is a Poisson random variable with E(X) = 5 then $E(X^2)$ =............

Let the joint p.d.f of two random variables *X* and *Y*

$f(x, y) = (2/3)(1+x)\, e^{-y}$, $0<x<1$, $y>0$. Then the marginal p.d.f of X is.............

If E(X.Y) = E(X) .E(Y) then x and y are ....

If X is a random variable E (e^{itx}) is known as __________ .

0. If a random variable X has mean 3 and standard deviation 4 the variance of the variable Y = 2x+ 5 is_______ .

1. If X and Y are independent and identical binomial random variable $B\left(3,\frac{1}{4}\right)$, then $Z = X + Y$ follows__________ .

2. The probability density function of Gamma distribution is _______ .

(12x1=12 Marks)

Part B

Answer any seven questions.
Each question carries two marks.

13. Define conditional Expectation.
14. State any four properties of expectation.
15. Define moment generating function and explain how it helps to generate moments.
16. Show that V(2X – 1) = 4 V(X).
17. Define Poisson distribution and obtain its mean?
18. State and prove the lack of memory property of Geometric distribution.
19. Define Cauchy Distribution.
20. Obtain the moment generating function of the Binomial distribution with parameter n and p
21. State Chebyshev's inequality.

(7x2=14 Marks)

Part C

Answer any six questions.
Each question carries five marks.

22. If (X , Y) is a pair of random variables then prove that correlation coefficient lies between -1 and +1
23. Let X be a random variable with the following probability mass function

x :	0	1	2	3
$p(x)$:	1/3	½	1/24	1/8

Find expected value of Y =(x-1)^2

24. Find MGF of a Poisson random variable. Hence establish additive property.
25. Derive the recurrence relation for central moments of Poisson distribution.
26. State the conditions and prove that Binomial distribution tends to Normal distribution.
27. Define Rectangular distribution and obtain its mean ,variance and mgf.
28. In a Normal Distribution 7% of observations are below 35 and 11% of observations are above 63. Find mean and standard deviation?
29. State and prove Lindberg – Levy central limit theorem.

(6x5=30 Marks

Part D

Answer any three questions.
Each question carries eight marks.

The joint probability density function of(X,Y) be

$f(x, y) = 3xy,\ 0 < x < 1, 0 < y < 1\ ; f(x, y) = 0, elsewhere$. Find

(a) $E(Y / X = x)$ (b)Cov(X,Y)

Fit a Poisson distribution to the following data

No. of deaths :	0	1	2	3	4
Frequency :	109	65	22	3	1

(a)If $X \rightarrow N(\mu, \sigma)$ Show that mean deviation about mean is$\sqrt{(2/\Pi)}\sigma$.

(b) Define beta distribution of first and second kind. Also obtain their means.

(a) State and prove weak law of large numbers.

(b)X and Y are independent Poisson variables with parameters λ_1 *and* λ_2. Obtain the conditional distribution of X/ X+Y

For the Geometric distribution $f(x) = 2^{-x}$, $x = 1,2,3$............ Prove that Chebyshev's inequality gives $P(|X - 2| \leq 2) > ½$ while the actual probability is 15/16.

(3x8=24 Marks)

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M18108 (Pages : 2) Reg. No:.............................

Name:...............................

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Second Semester B.Sc Statistics Degree Examination, March 2018

BASC2C02 –Life Contingencies

(2017 Admission onwards)

Time: 3 hours Max. Marks : 80

PART-A

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

1. If $f_x(x) = \lambda e^{-\lambda x}$, then $F_X(x) = \cdots$

   a) $e^{-\lambda x}$ b) $e^{\lambda x}$ c) $1 - e^{-\lambda x}$ d) none of these

2. If X is a random variable representing the future life time of a newborn baby, then Pr(X>x) is denoted by ……

   a) μ(x) b) F(x) c) f(x) d) S(x)

3. If T(x) = 15.7, then K(x) = …..

   a) 0.7 b) 5.7 c) 15 d) 15.7

4. If T(x) and K(x) represent the future life time and curtate future life time of life- age-(x), then the event {K(x)=5} is equivalent to :

   a) {T(x) = 5} b) {T(x) = 6} c) {5≤T(x)<6} d) {5<T(x)≤6}

5. If ${}_5p_{30} = 0.8$, then ${}_5q_{30} = \ldots$

   a) 0.3 b) 0.2 c) 0.1 d) 1

6. A …………….. is a contract to pay a benefit if and when the policy holder is diagnosed as suffering from a particular disease.

7. m –year deferred whole life insurance payable immediately on death is denoted by …

8. The simplest life insurance contract is ……………..

9. Total number of years lived beyond age x by the survivors of initial group is denoted by ……….

10. Calculate the value of e^0_{60} using AM92 ultimate mortality table.

11. A population is subject to a constant force of mortality 0.05. Calculate the probability that a life aged 20 exact will die before age 22.

12. Using CFM assumption, find ${}_{0.5}P_{70}$

(12 x 1= 12Marks)

PART-B

Answer any *seven* questions. Each question carries *two* marks.

13. Define k/q_{xy}

14. Define curtate future life time.

15. Define ${}_tq_x$

16. Define select mortality.

17. Prove the identity $\delta\bar{a}_x + \bar{A}_x = 1$.

18. Define joint life status.

19. Define insurance.

20. Calculate ${}_4P_{30}$ and ${}_2q_{40}$ from AM92 ultimate mortality at 6% interest.

21. Define continuous whole life annuity **(7 x 2 = 14 Marks)**

PART-C

Answer any *six* questions. Each question carries *five* marks.

22. Briefly explain present values of joint life and last survivor annuities.

23. Write a note on Analytical Laws of Mortality.

24. Prove that ${}_nq_{xy}^{2} = {}_nq_{xy}^{1} - {}_nP_x\, {}_nq_y$

25. Explain fully continuous whole life insurance.

    a) If A_x=0.25, A_{x+20}=0.40 and $A_{x:\overline{20}|} = 0.55$. calculate: a) $A_{x:\overline{20}|}^{\;\;1}$ b) $A^{1}_{x:\overline{20}|}$

26. Calculate the value of ${}_{1.75}P_{45.5}$ on the basis of mortality of AM92 ultimate and assuming that deaths are uniformly distributed between integral ages

27. Explain n-year temporary life annuity.

28. Distinguish between complete expectation of life and curtate expectation of life.

(6 x 5= 30Marks)

PART-D

Answer any *three* questions. Each question carries *eight* marks.

29. Explain n-year temporary life annuity due. Derive its variance.

30. Derive the relationship between Insurance payable at the moment of death and the end of the year of death.

31. Calculate ${}_3P_{63.5}$ based on the PFA92C20 table in the table using
    i. The UDD assumption.
    ii. The CFM assumption.

32. A life insurance company issues a joint life annuity to a male, aged 65, and female, aged 66. The annuity of Rs.15000 per annum is payable annually in arrears and continues until both lives have died. The Insurance company values this benefits using PFA92C20 mortality (males or females as appropriate) and 4.5% p.a. interest.
    i. Calculate the expected present value of this annuity.
    ii. Derive an expression for the variance of the present of this annuity in terms of appropriate single and joint-life assurance functions.

33. Briefly explain the two methods for life table functions at non-integer ages. **(3x8=24 M**