(6 pages) **Reg. No. :** .....

Code No. : 11557 E **Sub. Code : JMSS 5 C**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2018.

Fifth Semester

Statistics – Main

Major Elective II – ACTUARIAL STATISTICS

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Amount of money which equal to series of payments in future

   (a) nominal value of annuity

   (b) sinking value of annuity

   (c) present value of annuity

   (d) future value of annuity

2. Portion of formula used to calculate equal payment annuity [(1+i) < sup > n < / sup > - 1] / i (1+i) < sup > n < / sup > is classified as

   (a) series future growth data

   (b) series present worth factor

   (c) series future growth factor

   (d) series future worth factor

3. Process of loan repayment by installment payment is classified as

   (a) amortizing loan

   (b) depreciation loan

   (c) appreciation loan

   (d) appreciation of investment

4. Dollar amount of mortgage loan multiplied monthly payment of Mortgage loan per dollar is used to calculate

   (a) semi annually mortgage payment

   (b) daily mortgage payment

   (c) monthly mortgage payment

   (d) annually mortgage payment

5. The child mortality rate concerns children who die before their

   (a) first birthday (b) second birthday

   (c) fifth birthday (d) tenth birthday

6. Pro-natalist policies encourage

   (a) large families (b) small families

   (c) family planning (d) family lies

7. The difference between immigration and emigration is termed

   (a) migration difference

   (b) net migration

   (c) gross migration

   (d) total migration

8. Money sent back to their families by migrants is called

   (a) gifts (b) returns

   (c) remittances (d) postal orders

9. Which of the following is not part of the insuring agreement of a policy?

   (a) insured profits

   (b) premiums

   (c) exclusions

   (d) description of property insured

10. Very large risks are often insured by means of

   (a) extension policies

   (b) prescription policies

   (c) subscription policies

   (d) endorsements

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain accumulated value and presented value.

Or

   (b) What is the difference between ordinary annuity and annuity due?

12. (a) Define Redemption of loans and its method.

Or

(b) Explain the role of probability distribution in general insurance.

13. (a) Define measures of mortality.

Or

(b) Define force of mortality.

14. (a) Define mortality table and its columns.

Or

(b) Explain the incomplete mortality table.

15. (a) Explain principles of insurance.

Or

(b) Explain retrospective policy value and prospective policy value.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain annuity and its types.

Or

(b) What is the different b/w effective interest rate and nominal interest rate?

17. (a) Explain redemption of loans by installments payable times in a year.

Or

(b) Derive the exponential distribution uses general insurance.

18. (a) Explain vital statistics and its uses.

Or

(b) Define fertility and explain its measures.

19. (a) Briefly explain about expectation of life table.

Or

(b) Write the notes on:

(i) Select mortality table

(ii) Ultimate mortality table.

20. (a) Explain the assurance and its types.

Or

(b) Explain about premiums and its types.

———————

(7 pages) **Reg. No. :** .....

Code No. : 11547 E **Sub. Code : JMSS 11/ SMSS 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

First Semester

Statistics - Main

DESCRIPTIVE STATISTICS

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following statement is true?
   (a) Statistics is derived from the French word statistic"
   (b) Statistics is derived from the Latin word "status"
   (c) Statistics is derived from the Italian word "statita"
   (d) None of these

2. Class interval is measured as:

   (a) The sum of the upper and lower limit

   (b) Half of the sum of lower and upper limit

   (c) Half of the difference between upper and lower limit

   (d) The difference between upper and lower limit

3. Frequency distribution

   (a) Arranges observation in an increasing order

   (b) Arranges observations in terms of a number of groups.

   (c) Relates to a measurable characteristic

   (d) All of these

4. Which of the following measures of central tendency tends to be most influenced by an extreme score?

   (a) Median (b) Mode

   (c) Mean (d) All of these

5. Measures used to study the shape of the curve of a given distribution are marked as

   (a) Raw moments

   (b) measures of skewness

   (c) central moments

   (d) mean

6. The value of coefficient of Kurtosis β_2 can be _____

   (a) Less than 3

   (b) Greater than 3

   (c) Equal to 3

   (d) All the above

7. The normal probability curve is _____

   (a) Bell shaped

   (b) J shaped

   (c) S shaped

   (d) Cone shaped

8. Scatter diagram of the variate values (X, Y) given the idea about ————————

(a) Functional relationship

(b) Regression model

(c) Distribution of errors

(d) None of the above

9. Regression coefficient is independent of ————————

(a) Origin

(b) Scale

(c) Both origin and scale

(d) Neither origin nor scale

10. Regression equation is also named as ————————

(a) predication equation

(b) estimating equation

(c) line of average relationship

(d) all the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the uses of statistics in business.

Or

(b) Describe the characteristics and limitations of statistics?

12. (a) Define the following (i) Quartile Deviation. (ii) Standard Deviation.

Or

(b) Explain the difference between geometric mean and harmonic mean.

13. (a) Distinguish between Pearson's and Bowley's measures of skewness.

Or

(b) Explain difference between skewness and dispersion.

14. (a) Explain the concept of second degree parabola.

Or

(b) Explain the straight line equation with an illustration.

15. (a) Explain the regression equations with an example.

Or

(b) Explain scatter diagram with suitable example.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) What do you understand by classification of data? Describe the different methods.

Or

(b) Explain the following (i) Line diagram (ii) Frequency curve (iii) Histogram.

17. (a) Explain the co-efficient of variation with an example.

Or

(b) Describe the different measures of central tendency mentioning their merits and demerits.

18. (a) Explain kurtosis with example.

Or

(b) Calculate Pearson's coefficient of skewness.

x	12.5	17.5	22.5	27.5	32.5	37.5	42.5	47.5
f	28	42	54	108	129	61	45	33

19. (a) Explain principle of least squares with an illustration.

Or

(b) Fit a curve of the form $y = a + bx$ to the following data.

X	–4	1	3	2
Y	4	6	8	10

20. (a) Explain rank correlation with suitable example.

Or

(b) Obtain the regression equations for the following data :

$Y = 11.9 - 0.65X$ and $X = 16.4 - 1.3Y$

$S_{Y.X} = 0.787$ and $S_{X.Y} = 1.114$.

X	6	2	10	4	8
Y	9	11	5	8	7

———————

(7 pages) **Reg. No. :** .....

Code No. : 11562 E **Sub. Code : JASS 41**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2018.

Fourth Semester

Statistics – Allied

MATHEMATICAL COMPUTATIONS USING R

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. What will be the output of following code snippet?

```
> paste("a", "b", se = ". ")
```

(a) “a + b”

(b) “a = b”

(c) “ab”

(d) None of the mentioned

2. Name of the operator "<-"

   (a) Less than operator
   (b) Minus operator
   (c) Assignment operator
   (d) Equal operator

3. Point out the correct statement

   (a) In R, a function is an object which has the mode function
   (b) R interpreter is able to pass control to the functions along arguments that may be necessary for the function to accomplish the actions that are desired
   (c) Functions are also often written when code must be shared with others or the public
   (d) All of the mentioned

4. What is meant by "trim" in following statement mean(x, trim=0,na.rm=FALSE,..)

   (a) Nearest endpoint (b) Nearest beginpoint
   (c) Endpoint (d) Beginpoint

5. The ———— function returns a list of all the formula arguments of a function

   (a) formals( )
   (b) funct( )
   (c) formal ( )
   (d) All of the mentioned

6. The syntax of Binomial distribution is

   (a) binom(size, prob)

   (b) binom(prob, size)

   (c) bino(size,prob)

   (d) bino(prob,size)

7. Point out the wrong statement

   (a) A formal argument can be a symbol, a statement of the form 'symbol = expression', or the special formal argument

   (b) The first component of the function declaration is the keyword function

   (c) The value returned by the call to function is not a function

   (d) None of the mentioned

8. Histogram can be used only when

   (a) Class intervals are equal or unequal

   (b) Class intervals are equal

   (c) Class intervals are unequal

   (d) Frequencies in class interval are equal

9. What will be the output of following code?

```
> f <- function(a, b) {
+ a^2
+}
> f (2)
```

(a) 4

(b) 3

(c) 2

(d) All of the mentioned

10. Regression coefficient is independent of

(a) Origin

(b) Scale

(c) Both origin and scale

(d) Neither origin nor scale

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the history of R Programming.

Or

(b) Write the saving, stering and retrieving work in R.

12. (a) Write syntax to draw histogram with suitable illustration.

Or

(b) Write syntax of the following:

(i) Quartiles

(ii) Deciles

(iii) Percentiles.

13. (a) Write the classical and mathematical definition of probability.

Or

(b) Write the properties of Geometric distribution.

14. (a) Explain the applications of normal distribution.

Or

(b) Write the properties of gamma distribution.

15. (a) Explain correlation co efficient with example.

Or

(b) Describe the short note on regression line.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the step by step procedure for importing R data from other formats.

Or

(b) Explain the following:

(i) Arithmetic operators

(ii) Assignment operators

(iii) Comparison operators.

17. (a) Describe the procedure for drawing multiple bar chart in R.

Or

(b) Explain the measures of skewness and kurtosis with R.

18. (a) Write a fitting procedure for Binomial distribution in R.

Or

(b) Write a fitting procedure for geometric distribution in R.

19. (a) Write a fitting procedure for exponential distribution in R.

Or

(b) Write a fitting procedure for uniform distribution in R.

20. (a) Explain the inference procedure for correlation coefficient.

Or

(b) Explain the procedure for finding the regression equation.

———————

(7 pages) **Reg. No. :** .....

Code No. : 11657 E **Sub. Code : SSSS 3 A**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2018.

Third Semester

Statistics – Main

Skill Based Subject – MATHEMATICAL COMPUTATION USING 'R'

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions, choosing the correct answer.

Choose the correct answer :

1. R is an ———————— programming language
   (a) Closed source (b) GPL
   (c) Open source (d) Definite source

2. Which one of the following is the R command for creating numeric object a with value 5?
   (a) $a < -5; a$ (b) $a- < 5; a$
   (c) $a = -5; a$ (d) $a > -5; a$

3. Which of the following gives the summary of values likes mean etc?

   (a) mean (b) sd

   (c) describe (d) var

4. Hist() command used to create which of the following diagram

   (a) Pie diagram (b) Histogram

   (c) Bar diagram (d) Box plot

5. pbinom () is the function which gives

   (a) pdf of poisson

   (b) pdf of binomial

   (c) distribution function of binomial

   (d) quantiles of binomial

6. Quantiles of the Poisson distribution is calculated using function

   (a) ppois (b) dpois

   (c) qpois (d) rpois

7. Which of the following is pdf of uniform distribution?

   (a) dunif $(x,\ a=0, b=1)$

   (b) runif $(x,\ a=0, b=1)$

   (c) punif $(x,\ a=0,\ b=1)$

   (d) punif $(a=0, b=1,\ x)$

8. Which of the following is cdf of exponential distribution?

   (a) dexp() (b) pexp ()

   (c) qexp() (d) rexp()

9. Karl Pearsons correlation coefficient is calculate using the following command

   (a) Cor(x,y,method =”pearson”)

   (b) Cor(x,y, method =”kendel”)

   (c) Cor(x,y,method =”partial”)

   (d) Cor(x,y, method =”spearman”)

10. To obtain the fitted line of linear regression ———————— is used

    (a) Plot(x,y) (b) abline(model)

    (c) abline(xy) (d) plot(model)

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Create a data frame for the following data

S.No 1-4

Name Markov ,Pascal, Rao, Galton

Age 20, 15, 24, 70

Or

(b) Write R code for drawing box plot.

12. (a) Write R code for finding mean and median for the following data.

40, 34, 45, 23, 34, 45, 34, 23, 23

Or

(b) Write R code for drawing pie diagram for the following data.

Ice cream	sales
Blueberry	0.12
Vennilla	0.3
Mango	0.26
Chocolate	0.16
Pista	0.04
Others	0.12.

13. (a) Suppose that the number of defective items produced by a machine per day follows Poisson distribution with parameter 2. What is the probability that out of the total production of the day there are (i) exactly 2 defectives screw, (ii) at least one defective screw.

Or

(b) Write R code to find the probability of one boy and two girls in three children family.

14. (a) Write R commands to find pdf, cdf and quantiles for Exponential distribution.

Or

(b) What is the probability that a randomly selected first year student in higher education will have a height greater than 185cm? Given that the mean height is 170 cm and standard deviation is 10 cm.

15. (a) Write the command for testing correlation for two sided alternative with 5% level of significance.

Or

(b) Write R code for finding linear regression.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Explain different data types in R programming.

Or

(b) Describe the feature of drawing graph in R. Explain any three graph with R code.

17. (a) Write R code for finding skewness and kurtosis with example.

Or

(b) Write R code to calculate mean and standard deviation for the following data.

Number:	1	2	3	4	5	6	7	8
Plasma volume	2.75	2.86	3.37	2.76	2.62	3.49	3.05	3.12

18. (a) Mean and variance of binomial distribution are 2.5 and 1.875 respectively. Obtain the probability distribution and also plot the values.

Or

(b) Plot the probability mass function of Poisson distribution with rate $\lambda = 1.5$.

19. (a) Write R commands to find pdf, cdf and quantiles for Gamma distribution.

Or

(b) It has been suggested IQ scores follow a normal distribution with mean 100 and standard deviation 15. Find the probability that any person chosen at random will have (i) an IQ less than 70 (ii) an IQ greater than 110 and (iii) an IQ between 70 and 110.

20. (a) Write the command for finding correlation coefficient and also draw scatter plot.

X:	150	300	250	150	450	400	425	200	350	475
Y:	10	30	20	15	45	35	50	15	40	55

Or

(b) Write R code for finding linear regression for the following data.

X:	4	6	5	9	8	9	13	11	12
Y:	3	3	3	10	10	15	15	15	17

———————

(8 pages) **Reg. No. :** .....

Code No. : 11559 E **Sub. Code : JASS 11/ SASS 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018

First Semester

Statistics – Allied

MATHEMATICS — I

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The subnormal at any point on $y^2 = 4ax$ is _____

(a) Constant (b) 0

(c) $2x$ (d) a^2

2. The equation of the tangent of the curve $x = a\sin^3 t,\ y = b\cos^3 t$ at t is _____

(a) $\frac{x}{a}\csc t + \frac{y}{b}\sec t = 1$

(b) $\frac{x}{a}\csc t - \frac{y}{b}\sec t = 1$

(c) $\frac{x}{a}\csc t + \frac{y}{b}\sec t = -1$

(d) $\frac{x}{a}\csc t - \frac{y}{b}\sec t = -1$

3. The radius of curvature of the curve $x^4 + y^4 = 2$ at $(1,1)$ is _____

(a) $\frac{-\sqrt{2}}{3}$ (b) $\frac{\sqrt{2}}{3}$

(c) $\sqrt{\frac{2}{3}}$ (d) $\frac{2}{3}$

4. The envelope of the family of straight lines $y = mx + \frac{a}{m}$ is _____

(a) $y = 4ax$ (b) $y^2 = 4ax$

(c) $y^3 = 4ax$ (d) $y = 4a$

5. The value of $\int_{o}^{\infty}\int_{n}^{\infty}\frac{e^{-y}}{y}dxdy$ is _____

(a) 1 (b) –1

(c) 0 (d) ∞

6. The value of $\int_{0}^{1}\int_{0}^{2} ny^2 dydx$ is _____

(a) $\frac{4}{3}$ (b) $\frac{3}{4}$

(c) $\frac{-4}{3}$ (d) $\frac{-3}{4}$

7. The value of $\int_{-1}^{1}\frac{dx}{x^{213}}$ is _____

(a) 6 (b) 0

(c) $\frac{\pi}{2}$ (d) 2

8. The value of $\int_{0}^{\pi/2}\sin^{10}\theta\, d\theta$ is _____

(a) $\frac{63\pi}{512}$ (b) $\frac{3\pi}{512}$

(c) $\frac{65\pi}{512}$ (d) $\frac{5\pi}{512}$

9. The solution of $\frac{dy}{dx}+\left(\frac{1-y^2}{1-x^2}\right)^{1/2}=0$ is _____

(a) $\frac{x}{y}+e^{x^3}$ (b) $\frac{x}{y}+e^{x^2}$

(c) $\frac{x}{y}-e^{x^3}$ (d) $\frac{x}{y}+e^{-x^3}$

10. The value of $xp^2-2yp+x=0$ is _____

(a) $2cy=c^2x^2+1$ (b) $2cy=cx$

(c) $2cx=cy+1$ (d) $2cy=c^2x^2-1$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) At which point on the curve $y=x^3-12x+18$ is the tangent parallel to the x–axis.

Or

(b) Find $\frac{ds}{d\theta}$ and $\frac{ds}{dr}$ for the cardioid $r=a(1+\cos\theta)$.

12. (a) Find the envelope of the family of circles $(x-a)^2 + y^2 = 2a$.

Or

(b) Find the radius of curvature of the cardioid $r = a(1-\cos\theta)$.

13. (a) Evaluate $\iint r\sqrt{a^2 - r^2}\, dr\, d\theta$ over the upper half of the circle $r = a\cos\theta$.

Or

(b) Find the area of the Cardioid $r = a(1+\cos\theta)$.

14. (a) Evaluate $\int_0^{\pi/2} \sqrt{\tan\theta}\, d\theta$

Or

(b) Prove that $\int_0^{\pi/2} \frac{\cos^{2m-1}\theta \sin^{2n-1}\theta\, d\theta}{a\cos^2\theta + b\sin^2\theta} = \frac{\beta(m,n)}{2a^m b^n}$

15. (a) Solve : $x\frac{dy}{dx} + y\log n = e^x x^{1-\frac{1}{2}\log x}$

Or

(b) Solve :

$$p^2\left(x + y - \frac{2y}{x}\right)p + xy + \frac{y^2}{x^2} - y - \frac{y^2}{x} = 0$$

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) For the curves $x^2 = 4y$ and $y^2 = 4x$, find the angle intersection.

Or

(b) Find the length of arc in polar co–ordinates.

17. (a) Find the envelope of the straight lines $\frac{x}{a} + \frac{y}{b} = 1$ where the parameter are related by the equation $a^2 + b^2 = c^2$ where c is constant.

Or

(b) Show that the radius of curvature of the curve $r^n = a^2 \cos n\theta$ is $\frac{a^n r^{-n+1}}{n+1}$.

18. (a) A plane lamina of non–uniform density is in the form of a quadrant of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$. If the density at any point (x, y) is K_{xy}, where K is constant, find the co–ordinates of the centroid of the lamina.

Or

(b) Find the centroid of a loop of the laminacate $r^2 = a^2 \cos 2\theta$.

19. (a) Express $\int_0^1 x^m \left(1-x^n\right)^p dx$ interms of Gamma functions and evaluate the integral $\int_0^1 x^5 \left(1-x^3\right)^{10} dx$.

Or

(b) Prove that $\iiint \frac{dxdydz}{\left(1-x^2-y^2-z^2\right)} = \frac{\pi^2}{8}$, the integration extended to all positive values of the variables for which the expression is real.

20. (a) (i) Solve : $\frac{dy}{dx} = \frac{x + 2y - 3}{2x + v - 3}$

(ii) Solve : $(2x - 4y + 3)\frac{dy}{dx} + (x - 2y + 1) = 0$.

Or

(b) Solve :

$(1 - x)^2 \frac{dy}{dx} + 2xy = x\sqrt{1 - x^2}$ given $y = 0$ where $x = 0$.

(8 pages) **Reg. No. :** .....

Code No. : 11561 E **Sub. Code : JASS 31/ SASS 31**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

Third Semester

Statistics – Allied

MATHEMATICS - II

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Every polynomial of degree $n > 0$ has at least ———— root real or imaginary root

   (a) 1

   (b) 2

   (c) n

   (d) r

2. The equation $f(x) = 0$ is called a reciprocal equation if whenever α is a root of the equation, ——————— is also a root.

(a) $\frac{1}{n}$ (b) $\frac{1}{2}$

(c) $\frac{1}{\alpha}$ (d) 1

3. The partial differential equation formed by eliminating arbitrary functions from the equation $z = f(x^2 - y^2)$ is ———————

(a) $z = p + q$ (b) $z = p - q$

(c) $2z = xp + y\,q$ (d) $2z = xp \,/\, yq$

4. The partial differential equation has the general solution ———————

(a) $f\ (x^3 + y^3,\ x^2 + y^2) = 0$

(b) $f\,(x^3 - y^3,\ x^2 - y^2) = 0$

(c) $f\,(x^2 + y,\ x - y) = 0$

(d) none of these

5. If a continuous function decreases up to a certain value and then increases, that value is called a ———————— value of the function

(a) constant

(b) minimum

(c) maximum

(d) none of the above

6. If at all points in the neighbourhood of P, the curve is concave downwards, then the slope $\frac{dy}{dx}$ decreases as x ————————

(a) increases (b) decreases

c) positive (d) negative

7. The higher powers of D operating on x^m is give ————————

(a) -1 (b) 0

(c) 1 (d) ∞

8. $t^n f(t)$ is bounded near t = 0 for some number ————————

(a) $n = 1$ (b) $n < 1$

(c) $n > 1$ (d) $n \neq 1$

9. The expressions involving $x^2 + a^2$ can be integrated more conveniently by the substitution of ——————

(a) $x = a \sin \theta$ (b) $x = a \cos \theta$

(c) $x = a \tan \theta$ (d) none of the above

10. The value of $\int \frac{dx}{x^2 + 2x + 5}$ is

(a) $\tan^{-1}\left(\frac{x}{2}\right)$ (b) $\frac{1}{2}\tan^{-1}\left(\frac{x+1}{2}\right)$

(c) $\frac{1}{3}\tan^{-1}\left(\frac{x+1}{2}\right)$ (d) $\frac{1}{3}\tan^{-1}\left(\frac{x}{2}\right)$

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) If $\alpha, \beta, \gamma, \delta$ are the roots of $x^4 + px^3 + qx^2 + rx + s = 0$, find $(\alpha + \beta + \gamma)$ $(\beta + \gamma + \delta)$ $(\gamma + \delta + \alpha)$ $(\delta + \alpha + \beta)$.

Or

(b) Increase the roots of the equation $4x^5 - 2x^3 + 7x - 3 = 0$ by 2.

12. (a) Find the n^{th} differential coefficient of $\cos^4 x$.

Or

(b) Verify Euler's theorem when $u = x^3 + y^3 + z^3 + 3xyz$.

13. (a) Find the maximum value of $\sin^2 x(1+\cos x)^3$.

Or

(b) For what values of x is the curve $y = 3x^2 - 2x^3$ concave upwards and when is it convex upwards?

14. (a) Solve $\left(D^2 - 2mD + m^2\right) y = e^{mx}$.

Or

(b) Solve $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 5y = 0$.

15. (a) Solve $\int \frac{dx}{\sin x \cos^2 x}$.

Or

(b) Solve $\int \frac{dx}{x^2 - a^2} dx$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) If the sum of two roots of the equation $x^4 + px^3 + qx^2 + rx + s = 0$ equals the sum of the other two, prove that $p^3 + 8r = 4pq$.

Or

(b) Prove that the cubic $a_0 x^3 + 3a_1 x^2 + 3a_2 x + a_3 = 0$ can be reduce the form $z^3 + 3Hz + G = 0$ in which the second term is missing and the coefficient of the leading terms is unity, where $H = a_0 a_2 - a_1^2$ and $G = a_0^2 a_3 - 3a_0 a_1 a_2 + 2a_1^3$.

17. (a) If $u = \tan^{-1} \dfrac{x^3 + y^3}{x - y}$, prove that $x \dfrac{\partial u}{\partial x} + y \dfrac{\partial u}{\partial y} = \sin 2u$, using successive partial differentiation.

Or

(b) State and prove Euler's theorem.

18. (a) The cost of fuel in running an engine is proportional to the square of the speed and is Rs. 48 per hour for a speed of 16 m.p.h. Other costs amount to Rs. 300 per hour. What is the most economical speed?

Or

(b) Find the points of inflexion on the cubic $y = \frac{a^2 x}{x^2 + a^2}$ and show that they lie on a straight line.

19. (a) Show that the solution of the differential equation $\frac{d^2y}{dt^2} + 4y = A \sin pt$ which is such that $y = 0$ and $\frac{dy}{dt} = 0$ when $t = 0$ is $y = A\frac{\left(\sin pt - \frac{1}{2} p \sin 2t\right)}{4 - p^2}$, if $p \neq 2$

Or

(b) Solve $(x + a)^2 \frac{d^2y}{dx^2} - 4(x + a)\frac{dy}{dx} + 6y = x$.

20. (a) Solve $\int \frac{x+4}{6x-7-x^2}\,dx$.

Or

(b) Solve $\int \frac{x}{\sqrt{x^2+x+1}}\,dx$.

Reg. No. : .....

Code No. : 11548 E **Sub. Code : JMSS 12/ SMSS 12**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

First Semester

Statistics – Main

PROBABILITY THEORY

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Probability can take values

(a) $-\infty$ to ∞ (b) $-\infty$ to 1

(c) –1 to 1 (d) 0 to 1

2. If A is an event, the conditional probability of A given A is equal to ————————.

   (a) zero

   (b) one

   (c) infinite

   (d) indeterminate quantity

3. Probability mass function for a binomial distribution with usual notation is ————————.

   (a) $\binom{n}{x} p^n q^{n-x}$ (b) $\binom{n}{x} p^n q^x$

   (c) $\binom{n}{x} p^{n-x} q^x$ (d) $\binom{n}{x} p^x q^{n-x}$

4. For Bernoulli distribution with probability p of a success and q of a failure, the relation between mean and variance that holds is ————————.

   (a) mean < variance

   (b) mean > variance

   (c) mean = variance

   (d) mean ≤ variance

5. The conditional distribution functions of a variable Y given $X = x$ can be expressed as ————————.

(a) $F_{Y|X}(y \mid x) = P(Y \leq y \mid X = x)$

(b) $F_{Y|X}(y \mid x) = P(Y = y \mid X = x)$

(c) $F_{Y|X}(y \mid x) = \dfrac{P(Y \leq y \mid X \leq x)}{P(X = x)}$

(d) $F_{Y|X}(y \mid x) = \dfrac{P(Y = y \mid X = x)}{P(X = x)}$

6. For any two continuous variables X and Y, if a variable Z which is a linear combination of X and Y follows normal distribution, then X and Y are jointly follows ————————.

(a) jointly discrete distribution

(b) jointly continuous distribution

(c) bivariate normal distribution

(d) circular normal distribution

7. If X is a random variable having its probability density function $f(x)$, then $E(X)$ is called ————————.

(a) arithmetic mean (b) geometric mean

(c) harmonic mean (d) first quartile

8. If X and Y are two random variables, then ————————.

(a) $\{E(XY)\}^2 = E(X^2)E(Y^2)$

(b) $\{E(XY)\}^2 = E(X^2Y^2)$

(c) $\{E(XY)\}^2 \geq E(X^2)E(Y^2)$

(d) $\{E(XY)\}^2 \leq E(X^2)E(Y^2)$

9. The condition $(B_n / n^2) \to 0$ as $n \to \infty$ is necessary and sufficient for week law of large number to hold for a sequence of uniformly ————————.

(a) unbounded variates

(b) bounded variates

(c) unbounded sequence

(d) bounded sequence

10. The probability of the relative frequency being close top approaches to 1 when the number of trials ————————.

(a) finite (b) infinite

(c) decrease (d) increase

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What is the probability of getting 9 cards of the same suit ii one hand at a game of bridge?

Or

(b) Two computers *A* and *B* are to be marketed. A salesman who is assigned a job of finding customers for them has 60% and 40% chances respectively of succeeding in case of computer *A* and *B*. The two computers can be sold independently. Given that he was able to sell at least one computer, what is the probability that computer A has been sold?

12. (a) If $p(x) = \begin{cases} \frac{x}{15}, & x = 1, 2, 3, 4, 5 \\ 0, & elsewhere \end{cases}$, find

(i) $P(X = 1 \, or \, 2)$

(ii) $P\left\{\frac{1}{2} < X < \frac{5}{2} \middle| X > 1\right\}$.

Or

(b) A petrol pump is supplied with petrol once in a day. If its daily volume of sales (X) in thousands of litres is distributed according as $f(x) = 5(1-x)^4$, $0 \le x \le 1$. What must be the capacity of its tank in order that the probability that its supply will be exhausted in a given day shall be 0.01?

13. (a) If X and Y are two random variables having two joint probability density function :

$$f(x,y) = \begin{cases} \frac{1}{8}(6-x-y); 0 \le x < 2, 2 \le y < 4 \\ 0; \end{cases}$$; find

(i) $P(X < 1 \cap Y < 3)$

(ii) $P(X + Y < 3)$

(iii) $P(X < 1/Y < 3)$.

Or

(b) A random observation on a bivariate population (X, Y) can yield one of the following pairs of values with probabilities noted against them :

For each observation pair	Probability
(1,1); (2,1); (3,3); (4,3)	$\frac{1}{20}$
(3,1); (4,1); (1,2); (2,2); (3,2); (4,2); (1,3); (2,3)	$\frac{1}{10}$

Find the probability that $Y = 2$ given that $X = 4$. Also find the probability that $Y = 2$. Examine whether there two event $X = 4$ and $Y = 2$ are independent.

14. (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 $E(X)$ and $E\left(X^2\right)$ and using the laws of expectation, evaluate $E(2X+1)^2$.

Or

(b) If the moments of random variate X are defined by $E\left(X^r\right) = 0.6; r = 1, 2,....,$ show that $P(X = 0) = 0.4$, $P(X = 1) = 0.6$, $P(X \geq 2) = 0$.

15. (a) Let $X_1, X_2,...., X_n$ be i.i.d variables with mean μ and variance σ^2 and as $n \to \infty$, $\left(X_1^2 + X_2^2 + ... + X_n^2\right)/n \xrightarrow{p} c$, for some constant $(0 < e < \infty)$. Find c.

Or

(b) Let $X_k, u = 1, 2,..., X_n$ be mutually independent and identically distributed random variables with mean μ and finite variance. If $S_n = X_1 + X_2 + ... + X_n$, then prove that the law of large numbers does not hold for the sequence $\{S_n\}$ $S_n = X_1 + 2X_2 + 3X_2 + ... + nX_n$.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) An urn contains six white, four red and nine black balls If three balls are drawn at random, find the probability that

(i) two of the balls drawn are white,

(ii) one is of each colour

(iii) none is red

(iv) at least one is white.

Or

(b) State and prove multiplication theorem on probability.

17. (a) The diameter of an electric cable, say X is assumed to be a continuous random variable with probability density function $f(x) = 6x(1-x),\ 0 \le x \le 1$.

(i) Check that $f(x)$ is probability density function

(ii) Determine 'b' such that $P(X < b) = P(X > b)$.

Or

(b) Prove that the geometric mean G of the distribution, having the probability density function given by $6\log(16G) = 19$.

18. (a) The joint probability distribution of two random variables X and Y is given by $P(X = 0,\ Y = 1) = 1/3$, $P(X = 1,\ Y = -1) = 1/3$ and $P(X = 1,\ Y = 1) = 1/3$. Find

(i) Marginal distributions of X and Y

(ii) The conditional probability distribution of X given $Y = 1$.

Or

(b) Suppose that two-dimensional continuous random variable (X, Y) has joint probability density function given by

$$f(x,y) = \begin{cases} 6x^2y, & 0 < x < 1,\ 0 < y < 1 \\ 0, & \textit{elsewhere} \end{cases}.$$

(i) Find $P(0 < X < 3/4, 1/3 < Y < 2)$, $P(X + Y < 1)$, $P(X > Y)$ and $P(X < 1 \mid Y < 2)$.

(ii) Verify whether $\int_0^1 \int_0^1 f(x, y)\,dx\,dy = 1$ holds.

19. (a) State and prove Cauchy-Schwartz inequality.

Or

(b) The probability density function of the random variable X follows the probability law $P(x) = \frac{1}{2\theta} \exp\left(-\frac{|x - \theta|}{\theta}\right)$, $-\infty < x < \infty$.

Find the moment generating function of X. Using which, find $E(X)$ and $V(X)$.

20. (a) (i) Let X_i assume the values i and $-i$ with equal probabilities, show that the law of large numbers cannot be applied to the independent variables $X_1, X_2, \ldots$, i.e, X_i's.

(ii) If X_i can have only two values with equal probabilities i^{α} and $-i^{\alpha}$, show that law of large numbers can be applied to the independent variables $X_1, X_2, ...,$ if $\alpha < \frac{1}{2}$.

Or

(b) Let $X_1, X_2, X_3, ...$ be a sequence of independent and identically distributed random variable each with uniform distribution defined over [0, 1]. For the geometric mean $G_n = \left(X_1, X_{2,} .....X_n\right)^{1/n}$, show that $G_n \xrightarrow{p} c$ as $n \to \infty$ holds for some finite number *c*. Find *c*.

———————

(6 pages) **Reg. No. :** .....

Code No. : 11560 E **Sub. Code : JASS 21/ SASS 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

Second Semester

Statistics — Allied

PROGRAMMING WITH C

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. In C one statement can declare
   (a) only one variable
   (b) two variables
   (c) ten variables
   (d) any number of variables

2. How many keywords are there in ANSI C?

(a) 32 (b) 33

(c) 42 (d) 15

3. The keyword else can be used with

(a) if statement

(b) switch ( ) statement

(c) do...while ( ) statement

(d) none of the above

4. How many while statements are possible in do...while loop?

(a) 2 (b) 1

(c) 3 (d) none of the above

5. Arrays cannot be initialized if they are

(a) automatic (b) external

(c) static (d) none of the above

6. A character array always ends with

(a) null('\0') character

(b) question mark (?)

(c) full stop (.)

(d) none of the above

7. A global pointer can access variable of

   (a) all user defined functions

   (b) only main( ) function

   (c) only library functions

   (d) none of the above

8. The union holds

   (a) one object at a time

   (b) multiple objects

   (c) both (a) and (b)

   (d) none of the above

9. The fastest ways to exchange two rows in a two-dimensional array is

   (a) Exchange the addresses of each element in the rows

   (b) Exchange the elements of the two rows

   (c) Store the addresses of the rows in an array of pointers and exchange the pointers

   (d) None of the above

10. The EOF is equivalent to

   (a) –1 (b) 0

   (c) +1 (d) none of the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) List any three keywords with their use.

Or

(b) What is a variable and what is meant by "value" of a variable?

12. (a) Write the use of else and default statements in if...else and switch( ) statements.

Or

(b) What is a loop? Why it is necessary in the program?

13. (a) Explain two-dimensional array.

Or

(b) What are strings? How are they declared?

14. (a) What does it mean if there is no return statements in the function?

Or

(b) How to access structure members?

15. (a) How to declare pointer variables?

Or

(b) Explain the general format of fseek function.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Describe the three basic data types. How could be extend the range of values their represent?

Or

(b) Write a program to convert Fahrenheit to Celsius using the formula $C = \frac{F - 32}{1.8}$.

17. (a) Write a program to find the number of and sum of all integers greater than 100 and less than 200 that are devisable by 7.

Or

(b) Write a program to print the following outputs using for loop.

```
*   *   *   *   *   *
    *   *   *   *
        *   *   *
            *   *
                *
```

18. (a) Write a program to read a matrix of size $m \times n$ and print its transpose.

Or

(b) Explain string handling functions.

19. (a) Explain arguments but no return values.

Or

(b) Write a program to read and display car number, starting time and reaching time. Use structure within structure.

20. (a) Explain pointer expressions with example.

Or

(b) Distinguish between the following functions.

(i) feof ( ) and eof ( )

(ii) ferror ( ) and perror ( )

(iii) putw ( ) and getw ( )

(iv) putc ( ) and fputc ( ).

———————

(8 pages) **Reg. No. :** .....

Code No. : 11549 E **Sub. Code : JMSS 21/ SMSS 21**

B.A. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

Second Semester

Statistics — Main

SAMPLING TECHNIQUES

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions, choosing either (a) or (b).

1. Sampling frame is a term used for

(a) A list of random numbers

(b) A list of voters

(c) A list of sampling units of a population

(d) None of the above

2. Mailed questionnaire method of enquiry can be adopted if respondents

   (a) Live in cities

   (b) Have high income

   (c) Are educated

   (d) Are known

3. Sampling error can be reduced by

   (a) Choosing a proper probability sampling

   (b) Selecting a sample of adequate size

   (c) Using a suitable formula for estimation

   (d) All the above

4. The error emerging out of faulty planning of surveys are categorized as

   (a) Non-samp1ing errors

   (b) Non-response errors

   (c) Sampling errors

   (d) Absolute error

5. For estimating the population mean T, let T_1 be the sample mean under srswor and T_2 under srswr. Then :

   (a) $Var(T_1) = \text{var}(T_2)$

   (b) $Var(T_1) = 1/\text{var}(T_2)$

   (c) $Var(T_1) < \text{var}(T_2)$

   (d) $Var(T_1) \geq \text{var}(T_2)$

6. Increase in reliability and accuracy of results from a sampling Study with the increase in sample Size is known as the Principle of

   (a) Optimization

   (b) Statistical regularity

   (c) Law of increasing returns

   (d) Inertia of large numbers

7. Under equal allocation in stratified sampling, the sample from each stratum is:

   (a) Porportional to stratum size

   (b) Of same size from each stratum

   (c) In proportion to the per unit cost of survey of the stratum

   (d) All the above

8. Variance of $\bar{x}_{st}$ Under random sampling, proportional allocation and optimum allocation hold the correct inequality as :

   (a) $V_{ran}(\bar{x}_{st}) \leq V_{prop}(\bar{x}_{st}) \leq V_{opt}(\bar{\bar{x}}_{st})$

   (b) $V_{ran}(\bar{x}_{st}) \leq V_{prop}(\bar{x}_{st}) \leq V_{opt}(\bar{\bar{x}}_{st})$

   (c) $V_{ran}(\bar{x}_{st}) \leq V_{prop}(\bar{x}_{st}) \geq V_{opt}(\bar{\bar{x}}_{st})$

   (d) All the above

9. Linear and circular systematic sampling methods are equivalent if and only if and only

   (a) N is whole number

   (b) n is a whole number

   (c) $N = n$

   (d) None of the above

10. In what situation a systematic sample is more preferred than others?

   (a) When the data are on cards

   (b) When the items are in row

   (c) When the items situated at equal distances are uncorrelated

   (d) All the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What is the need of sampling as compared to Complete Enumeration?

Or

(b) Briefly explain the characteristics of a good questionnaire or a schedule.

12. (a) Define standard error of an estimator and discuss it briefly.

Or

(b) Explain sampling and non-sampling errors.

13. (a) Differentiate between simple random sampling with replacement and without replacement.

Or

(b) What are the factors responsible for the size of a sample? How sample size can be determined mathematically?

14. (a) What do you understand by stratified random sampling? Write about the advantages of using such sampling technique.

Or

(b) Give different formulae for mean and variance of stratified sample under different allocation techniques.

15. (a) What do you understand by systematic sampling?

Or

(b) Prove that in systematic sampling the sample mean is an unbiased estimator of population mean.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain about the different methods of statistical investigations.

Or

(b) Name different type of populations or universe and give their description summarily.

17. (a) Discuss about response and non-response errors.

Or

(b) Write a detailed note on the types of non-sampling error.

18. (a) Prove that in simple random sampling with replacement the sample mean is an unbiased estimator of the population mean.

Or

(b) Prove that if a simple random sample is drawn without replacement from a population then the following results are hold.

(i) $E(\bar{y}) = \overline{Y}$

(ii) $\text{var}(\bar{y}) = \frac{(1-f)}{n} S_y^2$.

19. (a) Mention the exigencies of stratified sampling and describe them in brief.

Or

(b) Discuss about optimum allocation with illustration.

20. (a) Compare systematic sampling with stratified sampling.

Or

(b) Write a detailed note about the types of systematic sampling techniques.

———————

(7 pages) **Reg. No. :** .....

Code No. : 11551 E **Sub. Code : JMSS 31/ SMSS 31**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

Third Semester

Statistics — Main

STATISTICAL DISTRIBUTIONS

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Let $f(x,y)=\begin{cases}1; & -x<y<x,\ 0<x<1\\ 0; & \text{otherwise}\end{cases}$. Then the marginal density function of X is

(a) $2x$ (b) 1

(c) $\frac{1}{2}x$ (d) $2y$

2. If X is a random variable which can take only non-negative values, then

   (a) $E(X^2)=[E[(X)]^2$

   (b) $E(X^2)\geq[E[(X)]^2$

   (c) $E(X^2)\leq[E[(X)]^2$

   (d) None of the above

3. The moment generating function of Bernouli distribution is

   (a) $(q+pe^t)^n$ (b) $(q+pe^t)^{-n}$

   (c) $(q+pe^t)$ (d) $(q+pe^{-t})$

4. Moment generating function of the Chi-Square distribution is

   (a) $(1-2it)^{n/2}$ (b) $(1-2t)^{n/2}$

   (c) $(1-2it)^{-n/2}$ (d) $(1-2t)^{-n/2}$

5. The number of possible sample of size n out of N population units without replacement is

   (a) $\binom{N}{n}$ (b) $(N)_n$

   (c) n^2 (d) $n!$

6. If $X_1, X_2,..,X_n$ are n i.i.d $C(\alpha,\beta)$ variates, the mean of X_i's is distribution as

(a) $c\left(\frac{\alpha}{n},\frac{\beta}{n}\right)$ (b) $c\left(\alpha,\frac{\beta}{\sqrt{n}}\right)$

(c) $c(\alpha,\ \beta)$ (d) $c(n\alpha,\ n\beta)$

7. If X and Y are two gamma variate $\gamma(n_1)$ and $\gamma(n_2)$, the distribution $\frac{X}{Y}$ is

(a) $\beta_1(n_1,\ n_2)$ (b) F_{n_1,n_2}

(c) $\beta_{II}(n_1,\ n_2)$ (d) $\gamma(n_1+n_2)$

8. The characteristic function of beta distribution of first kind, i.e., $\beta_1(\alpha,\ \beta)$ is

(a) $\frac{1}{B(\alpha,\beta)}\sum_{j=0}^{\infty}(it)^j B(\alpha+j;\beta)$

(b) $\frac{1}{B(\alpha,\beta)}\sum_{j=0}^{\infty}\frac{(it)^j}{j!}B(\alpha,\ \beta+j)$

(c) $\frac{1}{B(\alpha,\beta)}\sum_{j=0}^{\infty}\frac{(t)^j}{j!}B(\alpha+j,\beta)$

(d) $\frac{1}{B(\alpha,\beta)}\sum_{j=0}^{\infty}\frac{(it)^j}{j!}B(\alpha+j,\beta)$

9. If $\log_e x \sim N\ (\mu_1, \sigma_1^2)$ and $\log_e y \sim N(\mu_2, \sigma_2^2)$, the variable $\log_e x - \log_e y$ is distribution as

   (a) $N(\mu_1 - \mu_2,\ \sigma_1^2 - \sigma_2^2)$

   (b) $N(\mu_1 - \mu_2,\ \sigma_1^2 + \sigma_2^2)$

   (c) $N(\mu_1, \sigma_1^2) - N(\mu_2 - \sigma_2^2)$

   (d) None of the above

10. Student's t-distribution was given by-

   (a) G.W. Snedecor

   (b) R.A. Fisher

   (c) W.S. Gosset

   (d) None of the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) If X and Y are independent continuous random variables, then the p.d.f. of $U = X - Y$ is given by :

$$h(u) = \int_{-\infty}^{\infty} f(x, x+u)\ dx = \int_{-\infty}^{\infty} f_X(x)\ f_Y(x+u)\, dx\ .$$

Or

   (b) Show that if X and Y are random variables, then $E(X+Y) = E(X) + E(Y)$, provided all the expectation exists.

12. (a) Find mean and variance of uniform distribution.

Or

(b) Write a properties of characteristic function.

13. (a) Write down the moment generating function of uniform distribution.

Or

(b) Describe characteristic function of Cauchy distribution.

14. (a) Explain the moment generating function of Exponential distribution.

Or

(b) Write down the moment generating function of gamma distribution.

15. (a) Define sampling distribution and t-statistic.

Or

(b) Write down the important applications of F-distribution.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) A random variable X has the following probability function :

Value of X, x :	0	1	2	3	4	5	6	7
$P(x)$:	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$(7k^2 + k)$

Find (i) k (ii) evaluate $P(X < 6)$, $P(X \geq 6)$ and $P(0 < X < 5)$ (iii) If $P(X < a) \geq 1/2$.

Or

(b) State and prove the addition and multiplication theorems of expectation.

17. (a) Explain in detail about the followings

(i) Probability function

(ii) Characteristic function

(iii) Moment generating function.

Or

(b) Define binomial distribution. Derive the mean and variance of binomial distribution.

18. (a) Derive the moments of lognormal distribution and their properties.

Or

(b) Define Cauchy distribution and describe moment generating function.

19. (a) Derive the moments of beta distribution.

Or

(b) Discuss the properties of gamma distribution.

20. (a) Derive moment generating function of chi-square distribution and hence discuss the properties of chi-square distribution.

Or

(b) State and drive *F*-distribution.

———————

(7 pages) **Reg. No. : .....**

Code No. : 11553 E **Sub. Code : JMSS 51**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2018.

Fifth Semester

Statistics — Main

STATISTICAL INFERENCE — I

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Parameters are those constants which occur in
   (a) samples
   (b) probability density function
   (c) a formula
   (d) none of the above

2. If an estimator T_n of population parameter θ converges in probability to θ as n tends to infinity is said to be

   (a) sufficient (b) efficient

   (c) consistent (d) unbiased

3. Factorisation theorem for sufficiency is known as

   (a) Rao-Blackwell theorem

   (b) Crammer-Rao theorem

   (c) Chapman-Robins theorem

   (d) Fisher-Neyman theorem

4. A minimum variance unbiased estimator T_n is said to be unique if for any other estimator T_n^*

   (a) $\text{Var}(T_n) = \text{Var}(T_n^*)$

   (b) $\text{Var}(T_n) \leq \text{Var}(T_n^*)$

   (c) Both (a) and (b)

   (d) Neither (a) nor (b)

5. Generally the estimators obtained by the method of moments as compared to ML estimators are

   (a) less efficient (b) more efficient

   (c) equally efficient (d) none

6. The set of equations obtained in the process of least square estimation are called

   (a) normal equations

   (b) intrinsic equations

   (c) simultaneous equations

   (d) all the above

7. For a confidence coefficient $(1-\alpha)$ the most preferred confidence interval for the parameter θ is one

   (a) with shortest width

   (b) with largest width

   (c) with an average width

   (d) none of the above

8. A random sample of 16 housewives has an average body weight of 52 kg and an S.D. of 3.6 kg 99% central confidence limits for body weight in general are : $[t_{15,\ 0.01} = 2.95]$

   (a) (54.66; 49.345)

   (b) (52.66; 51.34)

   (c) (55.28; 48.72)

   (d) None of the above

9. Bayes approach uses ———————— only.

(a) sample information

(b) prior information

(c) posterior information

(d) none of the above

10. Bayes estimators are

(a) consistent (b) unbiased

(c) complete (d) efficient

PART B — (5 × 5 = 25 marks)

Answer ALL the questions choosing either (a) or (b).

11. (a) Define an estimate and estimator. Recall the characteristics of estimators.

Or

(b) Prove that the sample mean is an unbiased estimator of population mean of a normal population.

12. (a) Examine whether MVBE exists for θ in the Cauchy's population :

$$dF(x, \theta) = \frac{1}{\pi} \cdot \frac{1}{1+(x-\theta)^2} \quad -\infty < x < \infty .$$

Or

(b) State the regularity conditions to prove C-R inequality.

13. (a) Delineate about methods of estimation and state the various methods.

Or

(b) Find the maximum likelihood estimate for the parameter λ of a Poisson distribution on the basis of a sample size 'n'. Also find its variance.

14. (a) Give a detailed note about confidence interval and confidence limits.

Or

(b) A random sample of 10 boys had the following IQ : 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Obtain a reasonable range in which most of the mean IQ values of samples of 10 boys lie.

15. (a) Give an account of the properties of Bayes estimators.

Or

(b) Define loss function. And write a note on 0-1 loss function with an example.

PART C — (5 × 8 = 40 marks)

Answer ALL the questions, choosing either (a) or (b).

16. (a) Let $\{T_n\}$ be a sequence of estimators such that for all $\theta \in \Theta$,

(i) $E_\theta(T_n) \to \gamma(\theta)$, $n \to \infty$ and

(ii) $Var_\theta(T_n) \to 0$ as $n \to \infty$.

Then prove that T_n is a consistent estimator of $\gamma(\theta)$.

Or

(b) State Factorization theorem and find a sufficient estimator for θ, for a random sample of observations $x_1 x_2 \ldots x_n$ from a uniform population on $[0, \theta]$.

17. (a) State and derive C-R inequality. Bring out its significance.

Or

(b) Show that $\overline{X} = \frac{\Sigma X_i}{n}$, based on a random sample from

$$f(x, \theta) = \begin{cases} \frac{1}{\theta} e^{(-x/\theta)}; & 0 < x < \infty \\ 0\ ; & \text{otherwise} \end{cases}$$

where $0 < \theta < \infty$, is an MVBE of θ and has variance θ^2 / n.

18. (a) Let $X_1 X_2 \ldots X_n$ be a random sample from the normal population with density function $f(x, \mu, \sigma^2) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2\sigma^2}\Sigma(X_i-\mu)^2}$ find ML estimators of (i) μ when σ^2 is known and (ii) σ^2 when μ is known.

Or

(b) Describe the method of least squares for regression models and its properties.

19. (a) Obtain 95% confidence limit for population mean μ of the population $N(\mu, \sigma^2)$, when σ^2 is known.

Or

(b) How will you find the confidence limits for the mean of differences of paired observations from a bivariate normal distribution with an example?

20. (a) Find Baye's estimator of the parameter λ of the Poisson distribution when it is known that the prior distribution of λ is a gamma distribution.

Or

(b) Describe the procedure of finding Baye's estimators under quadrature error loss function.

———————

(6 pages) **Reg. No. :** .....

Code No. : 11554 E **Sub. Code : JMSS 52**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2018.

Fifth Semester

Statistics – Main

STATISTICAL QUALITY CONTROL

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. Variation in the items produced in a factory may be due to

   (a) chance factors

   (b) assignable causes

   (c) both (a) and (b)

   (d) none

2. The relation between expected value of R and S.D. σ with usual constant factors is

   (a) $E(R) = d_1\sigma$ (b) $E(R) = d_{2\sigma}$

   (c) $E(R) = D_1\sigma$ (d) $E(R) = D_2\sigma$

3. The trial control limits for $R-$ chart with usual constant factors are

   (a) $UCL = D_4 - R$, $CL = R$ and $LCL = D_3R$

   (b) $UCL = D_4\overline{R}$; $CL = \overline{R}$ and $LCL = D_3\overline{R}$

   (c) $UCL = D_4\overline{R}$; $CL = \overline{R}$ and $LCL = D_4\overline{R}$

   (d) all the above

4. If μ and σ are the process mean and S.D, then control limits $\mu \pm 3\sigma$ are known as

   (a) modified control limits

   (b) natural control limits

   (c) specified control limits

   (d) none of the above

5. Acceptance sampling plans are preferable due to

   (a) the economy in inspection
   (b) protection to perishable items
   (c) increased efficiency in the inspection of items
   (d) all the above

6. During items from a lot without giving any need to their quality is known as

   (a) random sampling

   (b) purposive sampling

   (c) systematic sampling

   (d) blind sampling

7. OC curve reveals the ability of the sampling plan to distinguish between

   (a) good and bad lists

   (b) good and bad sampling plans

   (c) good and bad product

   (d) all the above

8. Type 'B' OC curve usually evaluate

   (a) Consumer's risk (b) Producer's risk

   (c) Type I error (d) None

9. Sampling inspection by variables provides ———— protection than by attributes

   (a) better (b) worse

   (c) average (d) excellent

10. Sampling inspection procedure by variables are compared to by attributes is

(a) move prevalent (b) not practiced

(c) less prevalent (d) all the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Define SQC and its classifications due to causes.

Or

(b) Delineate about control limits, specification limits and tolerance limits.

12. (a) Bring out any five situations that depict lack of control in $\overline{X}$ and R charts.

Or

(b) State the applications of C-chart.

13. (a) Based on your view and understand, give a brief note on acceptance sampling plans.

Or

(b) Give a short note on producer's risk and consumers risk with an illustration.

14. (a) Explain in detail about Dodge Roming sampling plans.

Or

(b) With a neat sketch give the procedure of SSP.

15. (a) Explain the concept of acceptance sampling by variables.

Or

(b) Discuss the merits and demerits of variable sampling plan.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Delineate about SQC and its importance and applications techniques of SQC.

Or

(b) Describe the procedure for the construct of $\overline{X}$ and R chart.

17. (a) Bring out the construction of p-chart and d-chart.

Or

(b) Give control limits for C-charts when the number of defects charts in case of samples of equal size.

18. (a) Write a short notes on AQL, LTPD and AOQL.

Or

(b) With a neat sketch, delineate about ASN and OC curves.

19. (a) From a lot consisting of 2200 items, a sample of size 225 is taken. If it contains 14 or ten defectives, the list is accepted otherwise rejected. Plot the OC and ARQ curve.

Or

(b) Explain double sampling plan with its flow chart. In what way it is efficient than that of single sampling plan.

20. (a) Compare sampling inspection by variables with inspection by attributes.

Or

(b) Derive variable sampling plan with a single specification limit for large sample size when 'σ' is unknown.

———————

Reg. No. : .....

Code No. : 41150 B **Sub. Code : JAST 11/ SAST 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

First/Third Semester

Statistics — Allied

STATISTICS — I

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. μ_2 =

(அ) 1 (ஆ) 0

(இ) $\bar{x}$ (ஈ) σ^2

μ_2 =

(a) 1 (b) 0

(c) $\bar{x}$ (d) σ^2

2. இயல் வளைவரைக்கு β_2 =

(அ) 0 (ஆ) 1

(இ) 2 (ஈ) 3

For a normal curve β_2 =

(a) 0 (b) 1

(c) 2 (d) 3

3. ஒட்டுறவுக் கெழு $\gamma(x, y)$ =

(அ) $\frac{\text{cov}(x, y)}{\sigma_x \sigma_y}$ (ஆ) $\frac{\text{cov}(x, y)}{\sigma_x^2 \sigma_y^2}$

(இ) $\frac{\sigma_x \sigma_y}{\text{cov}(x, y)}$ (ஈ) $\frac{\sigma}{x} \times 100$

The correlation coefficient $\gamma(x, y)$ =

(a) $\frac{\text{cov}(x, y)}{\sigma_x \sigma_y}$ (b) $\frac{\text{cov}(x, y)}{\sigma_x^2 \sigma_y^2}$

(c) $\frac{\sigma_x \sigma_y}{\text{cov}(x, y)}$ (d) $\frac{\sigma}{x} \times 100$

4. தொடர்பு போக்கு கேடுகள் வெட்டிக் கொள்ளும் புள்ளி

(அ) $(0, 0)$ (ஆ) $(1, 1)$

(இ) $(\bar{x}, \bar{y})$ (ஈ) ஏதுமில்லை

The point of intersection of the lines of regression is

(a) $(0, 0)$ (b) $(1, 1)$

(c) $(\bar{x}, \bar{y})$ (d) none

5. $(\alpha B) + (\mathrm{A}B) =$

(அ) $(\alpha\beta)$ (ஆ) (A)

(இ) (B) (ஈ) (β)

$(\alpha B) + (\mathrm{A}B) =$

(a) $(\alpha\beta)$ (b) (A)

(c) (B) (d) (β)

6. $N = 1000, (A) = 600, (B) = 500, (AB) = 50$ எனில் தகவல்கள்

(அ) ஒருங்கமைவு பெற்றது

(ஆ) ஒருங்கமைவு அற்றது

(இ) போதுமானதல்ல

(ஈ) ஏதுமில்லை

If $N = 1000, (A) = 600, (B) = 500, (AB) = 50$, then the data are

(a) consistent (b) inconsistent

(c) not sufficient (d) none

7. $E(C) =$

(அ) 0 (ஆ) 1

(இ) C (ஈ) C^2

$E(C) =$

(a) 0 (b) 1

(c) C (d) C^2

8. ϕ என்பது தனி இயல்பு சார்பு எனில் $\phi(0) =$

(அ) 0 (ஆ) -1

(இ) 1 (ஈ) 2

If ϕ is the characteristic function, then $\phi(0) =$

(a) 0 (b) -1

(c) 1 (d) 2

9. பாய்சான் பரவலுக்கு $\mu_2^1 =$

(அ) λ (ஆ) λ^2

(இ) $\lambda^2 - \lambda$ (ஈ) $\lambda^2 + \lambda$

For the Poisson distribution, $\mu_2^1 =$

(a) λ (b) λ^2

(c) $\lambda^2 - \lambda$ (d) $\lambda^2 + \lambda$

10. $X \sim B(n, p)$ எனில் சராசரி =

(அ) np (ஆ) npq

(இ) pq (ஈ) $\sqrt{npq}$

If $X \sim B(n, p)$,then mean =

(a) np (b) npq

(c) pq (d) $\sqrt{npq}$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (அ) ஒரு பரவலுக்கு சராசரி = 10, விலக்க வர்க்கம் = 16, $\gamma_1 = 1$ மற்றும் $\beta_2 = 4$ எனில் பூஜ்யத்தைப் பொறுத்து முதல் நான்கு விலக்கப் பெருக்கத் தொகை காண்.

For a distribution, mean = 10, variance = 16, $\gamma_1 = 1$ and $\beta_2 = 4$. Obtain the first four moments about zero.

Or

(ஆ) கீழ்க்கண்ட தகவலுக்கு ஒரு நேர்கோடு பொருத்துக.

x :	0	5	10	15	20	25
y :	12	15	17	22	24	30

Fit a straight line for the following data :

x :	0	5	10	15	20	25
y :	12	15	17	22	24	30

12. (அ) நிரூபி : $-1 \leq r(x, y) \leq 1$.

Prove : $-1 \leq r(x, y) \leq 1$.

Or

(ஆ) கீழ்க்கண்ட தகவலுக்கு ஒட்டுறவுக் கெழு காண்.

x :	1	3	4	5	7	8	10
y :	2	6	8	10	14	16	20

Calculate the correlation coefficient for the following data.

x :	1	3	4	5	7	8	10
y :	2	6	8	10	14	16	20

13. (அ) $(AB) = 256, (\alpha\beta) = 768, (A\beta) = 48$ மற்றும் $(\alpha\beta) = 144$ எனில் A -ம், B -ம் சாராதவைகளா, மிகைத் தொடர்புடையவைகளை அல்லது குறைத் தொடர்புடையவைகளா எனக் காண்.

If $(AB) = 256, (\alpha\beta) = 768, (A\beta) = 48$ and $(\alpha\beta) = 144$, find whether A and B are independent, positively associated or negatively associated.

Or

(ஆ) நிரூபி : யூலின் தொடர்புக் கெழு $\theta = \frac{2y}{1+y^2}$.

Prove : Yule's coefficient of association $\theta = \frac{2y}{1+y^2}$.

14. (அ) கீழ்க்கண்ட இறுதியான வகுப்பு அலைவெண்களுக்கு மிகை வகுப்பு அலைவெண்கள் காண்.

$(ABC) = 149, (AB\gamma) = 738, (A\beta C) = 225$
$(A\beta\gamma) = 1196, (\alpha\beta C) = 204, (\alpha\beta\gamma) = 1762,$
$(\alpha\beta C) = 171$ மற்றும் $(\alpha\beta\gamma) = 21842$.

Given the following ultimate class frequencies, find the frequencies of positive class :
$(ABC) = 149, (AB\gamma) = 738, (A\beta C) = 225$,
$(A\beta\gamma) = 1196, (\alpha\beta C) = 204, (\alpha\beta\gamma) = 1762$,
$(\alpha\beta C) = 171$ and $(\alpha\beta\gamma) = 21842$.

Or

(ஆ) $p(x) = \begin{cases} \frac{x}{15}; x = 1, 2, 3, 4, 5 \\ 0 \ ; \text{மற்றபடி} \end{cases}$ எனில்

$p(x = 1$ அல்லது $2)$ மற்றும் $p\left(\frac{1}{2} < x < \frac{5}{2}\right)$ ஆகியவற்றை காண்க.

If $p(x) = \begin{cases} \frac{x}{15}; x = 1, 2, 3, 4, 5 \\ 0 \ ; \text{elsewhere} \end{cases}$, find $p(x = 1 \text{ or } 2)$ and $p\left(\frac{1}{2} < x < \frac{5}{2}\right)$.

15. (அ) x என்ற ஈருறுப்பு மாறிக்கு $n = 6$ மற்றும் $9p(x = 4) = p(x = 2)$ எனில் p -ன் மதிப்பு காண்.

Find the value of p for a binomial variate x, if $n = 6$ and $9p(x = 4) = p(x = 2)$.

Or

(ஆ) ஓர் இயல் நிலைப் பரவலின் கால்மான விலக்கம், சராசரி விலக்கம் மற்றும் திட்ட விலக்கம் ஆகியன தோராயமாக 10:12:15 என்ற விகிதத்தில் அமையும் எனக் காட்டுக.

Prove that for the normal distribution, the quartile deviation, the mean deviation and standard deviation are approximately in the ratio 10:12:15.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

16. (அ) கீழ்க்கண்ட பரவலுக்கு முதல் நான்கு விலக்கப் பெருக்குத் தொகை மற்றும் β_1, β_2 காண்.

x:	0	1	2	3	4	5	6	7	8
f:	1	8	28	56	70	56	28	8	1

Find the first four moments and β_1, β_2 for the following distribution.

x:	0	1	2	3	4	5	6	7	8
f:	1	8	28	56	70	56	28	8	1

Or

(ஆ) கீழ்க்கண்ட தகவலுக்கு ஓர் இருபடி பரவளையம் பொருத்துக.

x :	0	1	2	3	4
y :	1	5	10	22	38

Fit a second degree parabola for the following data.

x :	0	1	2	3	4
y :	1	5	10	22	38

17. (அ) கீழ்கண்ட தகவலுக்கு தர ஒட்டுறவுக் கெழு காண்.

x :	68	64	75	50	64	80	75	40	55	64
y :	62	58	68	45	81	60	68	48	50	70

Find the rank correlation coefficient for the following data.

x :	68	64	75	50	64	80	75	40	55	64
y :	62	58	68	45	81	60	68	48	50	70

Or

(ஆ) கீழ்கண்ட தகவலுக்கு உடன் தொடர்பு கோடுகளின் சமன்பாடுகள் காண்.

x :	25	28	30	32	35	36	38	39	42	45
y :	20	26	29	30	25	18	26	35	35	46

Obtain the equations of two lines of regression for the following data :

x :	25	28	30	32	35	36	38	39	42	45
y :	20	26	29	30	25	18	26	35	35	46

18. (அ) 1482 பேர் கொண்ட ஒரு கிராமத்தில் 368 பேர் சின்னம்மை நோயால் பாதிக்கப்பட்டுள்ளனர். அக்கிரமத்தில் 343 பேர் தடுப்பூசி போட்டுள்ளனர். தடுப்பூசி போட்டவர்களில் 35 பேர் பாதிக்கப்பட்டுள்ளனர் எனில் தடுப்பூசி போடுதல் நோய் தடுக்கும் முறை எனக் கொள்ளலாமா?

Of 1482 persons in a village, 368 were attacked by small-pox. In the village, 343 had been vaccinated and of these only 35 were attacked. Can vaccination be regarded as a preventive measure for small-pox?

Or

(ஆ) தந்தையின் அடர் நிற கண்ணுக்கும், மகனின் அடர்நிற கண்ணுக்கும் உரிய தொடர்பை ஆராய்க : தந்தைக்கும் மகனுக்கும் அடர் நிற கண்கள் 50 குடும்பங்களில்,

தந்தைக்கு அடர் நிற கண்கள் மகனுக்கு அல்ல 79 குடும்பங்களில்,

தந்தைக்கு அல்ல மகனுக்கு அடர் நிற கண்கள் 89 குடும்பங்களில்,

தந்தைக்கும் அல்ல மகனுக்கும் அல்ல 782 குடும்பங்களில்

Investigate the association between darkness of eye colour in father and son from the following data :

Fathers with dark eyes and sons with dark eyes : 50 families

Fathers with dark eyes and sons with not dark eyes : 79 families

Fathers with not dark eyes and sons with dark eyes : 89 families

Fathers with not dark eyes and sons with not dark eyes : 782 families.

19. (அ) ஒரு நாணயம் தலை விழும் வரை சுண்டப்படுகிறது. தேவையான சுண்டுதலின் எண்ணிக்கையின் எதிர்பார்ப்பு காண்.

A coin is tossed unit a head appears. What is the expectation of the number of tosses required?

Or

(ஆ) ஒரு மின்சார கம்பியின் விட்டம் X தொடர் சமவாய்ப்பு மாறியாக உள்ளது. அதன் நிகழ்தகவு பரவல் சார்பு $f(x) = 6x(1-x), 0 \le x \le 1$ எனில்

(i) $f(x)$ ஒரு நிகழ்தகவு பரவல் சார்பா என சரிபார்.

(ii) $p(x < b) = p(x > b)$ a என அமையும் b என்ற எண்ணைக் காண்.

The diameter of an electric cable, say X, is assumed to be a continuous random variable with pdf $f(x) = 6x(1-x), 0 \le x \le 1$.

(i) check that $f(x)$ is a pdf

(ii) determine a number b such that $p(x < b) = p(x > b)$.

20. (அ) ஒரு வெடிகுண்டு இலக்கைத் தாக்குவதற்கான வாய்ப்பு 50% ஓர் இலக்கு முற்றிலுமாக அழிக்கப்படுவதற்கு இரு நேரடித் தாக்குதல் தேவை. எனில் ஓர் இலக்கு முற்றிலும் அழிக்கப்படுவதற்கு குறைந்தபட்சம் 99% வாய்ப்பாக அமைய வேண்டுமானால் எத்தனை வெடிகுண்டுகள் எறியப்பட வேண்டும்.

In a precision bombing attack, there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give a 99% chance or letter of completely destroying the garget?

Or

(ஆ) X என்ற இயல் பரவலின் சராசரி 12, திட்டவிலக்கம் 4 எனில் காண்.

(i) $P(X \ge 20)$

(ii) $P(X \le 20)$

(iii) $P(0 \le X \le 12)$.

X is normally distributed and the mean of X is 12 and S.D. is 4. Find

(i) $P(X \geq 20)$

(ii) $P(X \leq 20)$

(iii) $P(0 \leq X \leq 12)$.

(6 pages) **Reg. No. :** .....

Code No. : 41150 E **Sub. Code : JAST 11/ SAST 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

First/Third Semester

Statistics — Allied

STATISTICS — I

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. μ_2 =

(a) 1 (b) 0

(c) $\bar{x}$ (d) σ^2

2. For a normal curve β_2 =

(a) 0 (b) 1

(c) 2 (d) 3

3. The correlation coefficient $\gamma(x, y) =$

(a) $\frac{\text{cov}(x, y)}{\sigma_x \, \sigma_y}$ (b) $\frac{\text{cov}(x, y)}{\sigma_x^2 \, \sigma_y^2}$

(c) $\frac{\sigma_x \, \sigma_y}{\text{cov}\,(x, y)}$ (d) $\frac{\sigma}{x} \times 100$

4. The point of intersection of the lines of regression is

(a) (0, 0) (b) (1, 1)

(c) $(\overline{x}, \overline{y})$ (d) none

5. $(\alpha B) + (\text{A}B) =$

(a) $(\alpha\beta)$ (b) (A)

(c) (B) (d) (β)

6. If $N = 1000, (A) = 600, (B) = 500, (AB) = 50$, then the data are

(a) consistent (b) inconsistent

(c) not sufficient (d) none

7. $E(C) =$

(a) 0 (b) 1

(c) C (d) C^2

8. If ϕ is the characteristic function, then $\phi(0) =$

(a) 0 (b) -1

(c) 1 (d) 2

9. For the Poisson distribution, $\mu_2^1 =$

(a) λ (b) λ^2

(c) $\lambda^2 - \lambda$ (d) $\lambda^2 + \lambda$

10. If $X \sim B(n, p)$,then mean =

(a) np (b) npq

(c) pq (d) $\sqrt{npq}$

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) For a distribution, mean = 10, variance = 16, $\gamma_1 = 1$ and $\beta_2 = 4$. Obtain the first four moments about zero.

Or

(b) Fit a straight line for the following data :

x :	0	5	10	15	20	25
y :	12	15	17	22	24	30

12. (a) Prove : $-1 \le r(x, y) \le 1$.

Or

(b) Calculate the correlation coefficient for the following data.

x :	1	3	4	5	7	8	10
y :	2	6	8	10	14	16	20

13. (a) If $(AB) = 256, (\alpha\beta) = 768, (A\beta) = 48$ and $(\alpha\beta) = 144$, find whether A and B are independent, positively associated or negatively associated.

Or

(b) Prove : Yule's coefficient of association $\theta = \dfrac{2y}{1+y^2}$.

14. (a) Given the following ultimate class frequencies, find the frequencies of positive class : $(ABC) = 149, (AB\gamma) = 738, (A\beta C) = 225$, $(A\beta\gamma) = 1196, (\alpha\beta C) = 204, (\alpha\beta\gamma) = 1762$, $(\alpha\beta C) = 171$ and $(\alpha\beta\gamma) = 21842$.

Or

(b) If $p(x) = \begin{cases} \frac{x}{15}; x = 1, 2, 3, 4, 5 \\ 0 \ ; \text{ elsewhere} \end{cases}$, find

$p(x = 1 \text{ or } 2)$ and $p\left(\frac{1}{2} < x < \frac{5}{2}\right)$.

15. (a) Find the value of p for a binomial variate x, if $n = 6$ and $9p(x = 4) = p(x = 2)$.

Or

(b) Prove that for the normal distribution, the quartile deviation, the mean deviation and standard deviation are approximately in the ratio 10:12:15.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Find the first four moments and β_1, β_2 for the following distribution.

x:	0	1	2	3	4	5	6	7	8
f:	1	8	28	56	70	56	28	8	1

Or

(b) Fit a second degree parabola for the following data.

x :	0	1	2	3	4
y :	1	5	10	22	38

17. (a) Find the rank correlation coefficient for the following data.

x :	68	64	75	50	64	80	75	40	55	64
y :	62	58	68	45	81	60	68	48	50	70

Or

(b) Obtain the equations of two lines of regression for the following data :

x :	25	28	30	32	35	36	38	39	42	45
y :	20	26	29	30	25	18	26	35	35	46

18. (a) Of 1482 persons in a village, 368 were attacked by small-pox. In the village, 343 had been vaccinated and of these only 35 were attacked. Can vaccination be regarded as a preventive measure for small-pox?

Or

(b) Investigate the association between darkness of eye colour in father and son from the following data :

Fathers with dark eyes and sons with dark eyes : 50 families

Fathers with dark eyes and sons with not dark eyes : 79 families

Fathers with not dark eyes and sons with dark eyes : 89 families

Fathers with not dark eyes and sons with not dark eyes : 782 families.

19. (a) A coin is tossed unit a head appears. What is the expectation of the number of tosses required?

Or

(b) The diameter of an electric cable, say X, is assumed to be a continuous random variable with pdf $f(x) = 6x(1-x), 0 \le x \le 1$.

(i) check that $f(x)$ is a pdf

(ii) determine a number b such that $p(x < b) = p(x > b)$.

20. (a) In a precision bombing attack, there is a 50% chance that any one bomb will strike the target. Two direct hits are required to destroy the target completely. How many bombs must be dropped to give a 99% chance or letter of completely destroying the garget?

Or

(b) X is normally distributed and the mean of X is 12 and S.D. is 4. Find

(i) $P(X \geq 20)$

(ii) $P(X \leq 20)$

(iii) $P(0 \leq X \leq 12)$.

———————

Reg. No. :.....

Code No. : 41151 B **Sub. Code : JAST 21/ SAST 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

Second/Fourth Semester

Statistics — Allied

STATISTICS — II

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. லாஸ்பியர் மற்றும் பாசிஸ் குறியீட்டெண்களின் கூட்டு சராசரி ————

(அ) பிஷ்சர்

(ஆ) கெல்லி

(இ) பௌலி

(ஈ) மார்ஷல்-எட்ச்வொர்த்

The arithmetic mean of Laspeyre's and Paasche's index numbers is ———————— index number.

(a) Fisher's

(b) Kelley's

(c) Bowley's

(d) Marshall–Edgeworth

2. கால மாற்றுச் சோதனைக்கான சூத்திரம் ————————

(அ) $I_{01} \times I_{10} = 1$ (ஆ) $I_{01} + I_{10} = 1$

(இ) $I_{01} \times I_{10} = 100$ (ஈ) $I_{01} - I_{10} = 0$

The formula for the time reversal test is

(a) $I_{01} \times I_{10} = 1$ (b) $I_{01} + I_{10} = 1$

(c) $I_{01} \times I_{10} = 100$ (d) $I_{01} - I_{10} = 0$

3. n-ன் மதிப்பு ———————— ஆக இருக்கும்போது சிறு கூறு உபயோகத்திற்கு வரும்.

(அ) = 30 (ஆ) ≥ 30

(இ) < 30 (ஈ) ≤ 30

Small sample theory is applicable when n is

(a) = 30 (b) ≥ 30

(c) < 30 (d) ≤ 30

4. சூனிய எடுகோள் ஒத்துக் கொள்ளப்படும் பட்சத்தில் இரண்டாம் வகை பிழைகள் ஏற்படுமெனில் அது ————

(அ) உண்மை

(ஆ) உண்மையல்ல

(இ) பாதி உண்மை பாதி பொய்

(ஈ) ஒதுக்கப்படும்

Type II errors are made when we accept a null hypothesis which is

(a) true

(b) not true

(c) half true and half false

(d) rejected

5. சிறு கூற்றில் இரு சராசரிகளின் வித்தியாசங்களை சோதிக்க உதவும் சூத்திரம்

(அ) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}$

(ஆ) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 + n_2}{n_1 n_2}}$

(இ) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 n_2}{n_1 + n_2}}$

(ஈ) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 - n_2}{n_1 n_2}}$, இங்கு $S^2 = \dfrac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}$

In the case of small samples, the difference of two means is tested by the formula

(a) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}$

(b) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 + n_2}{n_1 n_2}}$

(c) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 n_2}{n_1 + n_2}}$

(d) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 - n_2}{n_1 n_2}}$, here $S^2 = \dfrac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}$

6. கை வர்க்க சோதனையின் வரையறை ————————

(அ) $\chi^2 = \sum \dfrac{(O+E)^2}{E}$ (ஆ) $\chi^2 = \sum \left(\dfrac{O+E}{E}\right)^2$

(இ) $\chi^2 = \sum \dfrac{(O-E)}{E}$ (ஈ) $\chi^2 = \sum \dfrac{(O-E)^2}{E}$

χ^2 – test is defined as

(a) $\chi^2 = \sum \dfrac{(O+E)^2}{E}$ (b) $\chi^2 = \sum \left(\dfrac{O+E}{E}\right)^2$

(c) $\chi^2 = \sum \dfrac{(O-E)}{E}$ (d) $\chi^2 = \sum \dfrac{(O-E)^2}{E}$

7. இருவழி பாகுபாடு மாதிரியின் மொத்த வரையற்ற பாகைகள் ————————

(அ) $(c-1)(r-1)$ (ஆ) $cr-1$

(இ) $cr-2$ (ஈ) $c+r-2$

In two-way classification model, the total d.f. is

(a) $(c-1)(r-1)$ (b) $cr-1$

(c) $cr-2$ (d) $c+r-2$

8. R.A. பிஸ்ஸரின் ஆற்றல் மிக்க புள்ளியில் உபகரணம்

(அ) மாறுபாட்டு பகுப்பாய்வு

(ஆ) t-தேர்வு

(இ) பிஸ்ஸரின் குறியீட்டெண்

(ஈ) கைவர்க்க தேர்வு

A powerful statistical tool suggested by R.A. Fisher is

(a) Analysis of variance

(b) t-test

(c) Fisher's Index Number

(d) Chi-square test

9. ஒரு கட்டுப்பாட்டு விளக்கப்படத்தில் உச்ச கட்டுப்பாட்டு எல்லையானது

(அ) குறை மதிப்பு

(ஆ) எப்பொழுதும் மிகை மதிப்பு

(இ) குறை மதிப்புமில்லை மிகை மதிப்புமில்லை

(ஈ) எப்பொழுதும் பூச்சியம்

In a control chart, the upper control limit can be

(a) negative

(b) always positive

(c) neither negative nor positive

(d) always zero

10. வீச்சு விளக்கப்படத்தில் குறைந்த கட்டுப்பாட்டு எல்லையானது

(அ) $D_2\sigma$ (ஆ) $D_1\sigma$

(இ) $D_3\sigma$ (ஈ) $D_4\sigma$

The lower control limit for range chart is

(a) $D_2\sigma$ (b) $D_1\sigma$

(c) $D_3\sigma$ (d) $D_4\sigma$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (அ) குறியீட்டெண்களின் சிறப்பில்புகளைக் கூறுக.

Explain the characteristics of index numbers.

Or

(ஆ) அலகு சோதனையை விவரி.

Describe unit test.

12. (அ) ஒரு இயல்பான தொகுதியின் சராசரி 6.48 மற்றும் திட்டவிலக்கம் 1.5. 400 உறுப்புக்களைக் கொண்ட ஒரு மாதிரியின் சராசரி 6.75. இந்த மாறுபாடு முக்கியத்துவம் உள்ளதா?

A normal population has mean of 6.48 and S.D. of 1.5. In a sample of 400 members mean is 6.75. Is the difference significant?

Or

(ஆ) ஒரு ஆறுமுக பகடை 324 முறை வீசப்படுகிறது. அதில் 181 முறை ஒற்றை எண்கள் கிடைக்கிறது. அந்த பகடை ஒரு புற சாய்வற்றது என குறிப்பிடத்தக்கதா?

A six faced die is thrown 324 times and it falls with 181 times odd number. Discuss whether the die may be regarded as unbiased one.

13. (அ) ஒரு இயல்நிலை பரவல் தொகுதியிலிருந்து பெறப்பட்ட மாதிரி 15, 17, 10, 18, 16, 9, 7, 11, 13, 14 எனில் இயல்நிலை பரவல் மாதிரியின் சராசரிக்கான 95% நம்பதகுந்த எல்லையைக் காண்க.

Find 95% confidence limits for the mean of a normally distributed population for which the sample 15, 17, 10, 18, 16, 9, 7, 11, 13, 14 was taken.

Or

(ஆ) சிறு மாதிரிகளுக்கான ஏதேனும் இரு சோதனைகளைக் கூறி அவற்றின் பயன்களை விவரி.

Name any two small sample tests and explain their uses.

14. (அ) ஒரு லத்தீன் சதுர அமைப்புத் திட்டத்தை விவரி.

Explain Latin Square Design.

Or

(ஆ) 12 நிலப்பகுதிகளில் *A, B, C* என்ற மூன்று வகையான கோதுமையின் விளைபலன் கீழே கொடுக்கப்பட்டுள்ளது.

A :	14	16	18		
B :	14	13	15	22	
C :	18	16	19	19	20

மூன்று வகையான கோதுமையின் விளை பலன்களின் வித்தியாசம் குறிப்பிட தகுந்ததா என ஆராய்க.

The following figures relate to the yield of three varieties *A, B, C* of Wheat in 12 plots.

A :	14	16	18		
B :	14	13	15	22	
C :	18	16	19	19	20

Is there any significant difference in the yield of three varieties?

15. (அ) P-படம் அமைக்கும் முறையினை விவரி.

Explain the construction of *P*-chart.

Or

(ஆ) சராசரி μ மற்றும் பரவற்படி σ^2 உள்ள தொகுதியிலிருந்து பெறப்பட்ட n-அளவுள்ள மாதிரியிலிருந்து $\overline{X}$ – படத்தை எவ்வாறு தயார் செய்வாய்?

How will you prepare $\overline{X}$ – chart from a sample of size 'n' taken from a population with mean μ and variance σ^2 ?

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (அ) விலைக்கான குறியீட்டெண்களை பின்வரும் விபரங்களிலிருந்து

(i) லாஸ்பியர் முறை

(ii) பாஷேயின் முறை

(iii) மார்ஷல் எட்ஜ்வொர்த் முறை ஆகியவற்றை பயன்படுத்தி காண்க.

	2015		2016	
	p_0	q_0	p_1	q_1
A	2	8	4	6
B	5	10	6	5
C	4	14	5	10
D	2	19	2	13

Construct index numbers of price from the above data by applying :

(i) Laspeyre's method.

(ii) Paasche's method.

(iii) Marshall-Edgeworth method.

	2015		2016	
	p_0	q_0	p_1	q_1
A	2	8	4	6
B	5	10	6	5
C	4	14	5	10
D	2	19	2	13

Or

(ஆ) பிஸ்ஸரின் குறியீட்டெண் ஒரு தனிக் குறியீட்டெண் என நிறுவுக. மேலும் அது மூன்று விதமான சோதனைகளையும் நிறைவு செய்யுமா என சோதிக்கவும்.

Prove that Fisher's index number is an ideal index number. Verify whether the Fisher's index number satisfies the three tests for ideal number.

17. (அ) ஒரு நகரத்தில் 600 பேர்களைக் கொண்ட ஒரு மாதிரியில் 400 பேர் புகை பிடிப்பவர்கள். மற்றொரு நகரத்தில் 900 பேர்களில் 450 பேர் புகை பிடிப்பவர்கள் எனில் இந்த நகரங்களில் புகை பிடிப்பவர்களின் எண்ணிக்கையில் குறிப்பிடத்தக்க அளவு மாறுபாடு இருக்கிறதா என சோதிக்கவும்.

In a sample of 600 person from a city, 400 are found to be smokers. In one of 900 from another city 450 are smokers. Do the data indicate that the cities are significantly different with respect to the prevalence of smoking among the persons?

Or

(ஆ) சூனிய எடுகோள் மற்றும் மாற்று எடுகோள் ஆகியவற்றை விவரி.

Explain Null hypothesis and Alternative hypothesis.

18. (அ) ஓர் இயல்நிலை இனத்தொகுதியிலிருந்து எடுக்கப்பட்ட 8, 7 எண்ணிக்கையுள்ள இரண்டு சார்பிலா மாதிரிகள் கீழே தரப்பட்டுள்ளன.

மாதிரி 1 : 9 11 13 11 15 10 13 14

மாதிரி 2 : 11 12 11 14 9 10 10 —

விலக்க வர்க்க சராசரிகளின் வித்தியாசம் முக்கியத்துவம் வாய்ந்ததா எனக் காண்க.

Two independent samples of 8 and 7 items respectively drawn from a normal population are given below :

Sample 1 : 9 11 13 11 15 10 13 14

Sample 2 : 11 12 11 14 9 10 10 —

Find whether the variances differs significantly.

Or

(ஆ) 10 பேர் கொண்ட குழுவிற்கு A என்ற சத்துணவும், 8 பேர் கொண்ட வேறு ஒரு குழுவிற்கு B என்ற சத்துணவும் கொடுத்ததில் கீழ்காணும் எடை அதிகரிப்புகள் காணப்பட்டன.

உணவு A : 5 6 8 1 12 4 3 9 6 10

உணவு B : 2 3 6 8 1 10 2 8 — —

இவ்விபரங்களிலிருந்து A-யின் தரம், B-யின் தரத்தை விட சிறந்தது எனக் கூறு இயலுமா?

A diet '*A*' was given to a group of 10 individuals and a diet '*B*' was given to another group of 8 individuals. The increase in the weight are given below :

Diet *A* :	5	6	8	1	12	4	3	9	6	10
Diet *B* :	2	3	6	8	1	10	2	8	—	—

On the basis of this data, can you say that the quality of *A* is better than that of *B*?

19. (அ) கீழ்காணும் விபரங்களுக்கு மாறுபாட்டு பகுப்பாய்வை பயன்படுத்தி முடிவை விளக்கு.

	A	*B*	*C*	*D*
	8	12	18	13
	10	11	12	9
மதிப்பெண்கள்	12	9	16	12
	8	14	6	16
	7	4	8	15

Carry out an analysis of variance technique and comment on the result for the following data :

	A	*B*	*C*	*D*
	8	12	18	13
	10	11	12	9
Marks	12	9	16	12
	8	14	6	16
	7	4	8	15

Or

(ஆ) ஒரு லத்தீன் சதுரத்தில், மொத்த கூடுதல் சதுரங்களை, வரிசைகள், பத்திகள், நடத்தும் முறை மற்றும் பிழைகள் என 4 கூறுகளாக எவ்வாறு பிரிக்க முடியும் எனக் காட்டுக.

In the Latin square layout, show how to split the total sum of squares into four components due to rows, columns, treatment and errors.

20. (அ) கூறுவெளி ஆய்வு திட்டத்திற்கு உபயோகமுள்ள பல்வேறு உறுப்புக்களை விவரிக்க.

Explain the various terms used in sampling inspection plan.

Or

(ஆ) (i) $\overline{X}$ – வரைபடத்தை விட R-வரைபடம் எவ்விதத்தில் மேன்மையானது என கூறுக.

(ii) மிகக்குறைவான குறைபாடு $\overline{p}$, உடைய $n = 300$ பருமன் மாதிரியில் 0.45. இதிலிருந்து

(1) np – வரைபடம் மற்றும்

(2) p-வரைபடத்தின் மேல் எல்லை மற்றும் கீழ் எல்லையைக் காண்க.

(i) State the advantages of R-chart over $\overline{X}$ – chart.

(ii) The fraction defective $\overline{p}$ based on a sample size $n = 300$ is 0.45. Compute the upper and lower limit for

(1) np – chart and

(2) p-chart.

———————

(7 pages) **Reg. No. :**.....

Code No. : 41151 E **Sub. Code : JAST 21/ SAST 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2018.

Second/Fourth Semester

Statistics — Allied

STATISTICS — II

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The arithmetic mean of Laspeyre's and Paasche's index numbers is ———————— index number.

   (a) Fisher's

   (b) Kelley's

   (c) Bowley's

   (d) Marshall–Edgeworth.

2. The formula for the time reversal test is

(a) $I_{01} \times I_{10} = 1$ (b) $I_{01} + I_{10} = 1$

(c) $I_{01} \times I_{10} = 100$ (d) $I_{01} - I_{10} = 0$.

3. Small sample theory is applicable when n is

(a) $= 30$ (b) ≥ 30

(c) < 30 (d) ≤ 30.

4. Type II errors are made when we accept a null hypothesis which is

(a) true

(b) not true

(c) half true and half false

(d) rejected.

5. In the case of small samples, the difference of two means is tested by the formula

(a) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}$

(b) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 + n_2}{n_1 n_2}}$

(c) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 n_2}{n_1 + n_2}}$

(d) $t = \dfrac{\bar{x}_1 - \bar{x}_2}{S}\sqrt{\dfrac{n_1 - n_2}{n_1 n_2}}$, here $S^2 = \dfrac{n_1 s_1^2 + n_2 s_2^2}{n_1 + n_2 - 2}$.

6. χ^2 – test is defined as

(a) $\chi^2 = \sum \frac{(O+E)^2}{E}$ (b) $\chi^2 = \sum \left(\frac{O+E}{E}\right)^2$

(c) $\chi^2 = \sum \frac{(O-E)}{E}$ (d) $\chi^2 = \sum \frac{(O-E)^2}{E}$.

7. In two-way classification model, the total d.f. is

(a) $(c-1)(r-1)$ (b) $cr-1$

(c) $cr-2$ (d) $c+r-2$.

8. A powerful statistical tool suggested by R.A. Fisher is

(a) Analysis of variance

(b) *t*-test

(c) Fisher's Index Number

(d) Chi-square test.

9. In a control chart, the upper control limit can be

(a) negative

(b) always positive

(c) neither negative nor positive

(d) always zero.

10. The lower control limit for range chart is

(a) $D_2\sigma$ (b) $D_1\sigma$

(c) $D_3\sigma$ (d) $D_4\sigma$.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Explain the characteristics of index numbers.

Or

(b) Describe unit test.

12. (a) A normal population has mean of 6.48 and S.D. of 1.5. In a sample of 400 members mean is 6.75. Is the difference significant?

Or

(b) A six faced die is thrown 324 times and it falls with 181 times odd number. Discuss whether the die may be regarded as unbiased one.

13. (a) Find 95% confidence limits for the mean of a normally distributed population for which the sample 15, 17, 10, 18, 16, 9, 7, 11, 13, 14 was taken.

Or

(b) Name any two small sample tests and explain their uses.

14. (a) Explain Latin Square Design.

Or

(b) The following figures relate to the yield of three varieties *A, B, C* of Wheat in 12 plots.

A :	14	16	18		
B :	14	13	15	22	
C :	18	16	19	19	20

Is there any significant difference in the yield of three varieties?

15. (a) Explain the construction of *P*-chart.

Or

(b) How will you prepare $\overline{X}$ – chart from a sample of size '*n*' taken from a population with mean μ and variance σ^2 ?

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Construct index numbers of price from the above data by applying :

(i) Laspeyre's method.

(ii) Paasche's method.

(iii) Marshall-Edgeworth method.

	2015		2016	
	p_0	q_0	p_1	q_1
A	2	8	4	6
B	5	10	6	5
C	4	14	5	10
D	2	19	2	13

Or

(b) Prove that Fisher's index number is an ideal index number. Verify whether the Fisher's index number satisfies the three tests for ideal number.

17. (a) In a sample of 600 person from a city, 400 are found to be smokers. In one of 900 from another city 450 are smokers. Do the data indicate that the cities are significantly different with respect to the prevalence of smoking among the persons?

Or

(b) Explain Null hypothesis and Alternative hypothesis.

18. (a) Two independent samples of 8 and 7 items respectively drawn from a normal population are given below :

Sample 1 :	9	11	13	11	15	10	13	14
Sample 2 :	11	12	11	14	9	10	10	—

Find whether the variances differs significantly.

Or

(b) A diet '*A*' was given to a group of 10 individuals and a diet '*B*' was given to another group of 8 individuals. The increase in the weight are given below :

Diet *A* :	5	6	8	1	12	4	3	9	6	10
Diet *B* :	2	3	6	8	1	10	2	8	—	—

On the basis of this data, can you say that the quality of *A* is better than that of *B*?

19. (a) Carry out an analysis of variance technique and comment on the result for the following data :

	A	*B*	*C*	*D*
	8	12	18	13
	10	11	12	9
Marks	12	9	16	12
	8	14	6	16
	7	4	8	15

Or

(b) In the Latin square layout, show how to split the total sum of squares into four components due to rows, columns, treatment and errors.

20. (a) Explain the various terms used in sampling inspection plan.

Or

(b) (i) State the advantages of R-chart over $\overline{X}$ – chart.

(ii) The fraction defective $\overline{p}$ based on a sample size n = 300 is 0.45. Compute the upper and lower limit for

(1) np – chart and

(2) p-chart.

———————

(7 pages) **Reg. No. :** .....

Code No. : 11556 E **Sub. Code : JMSS 5 B**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2018.

Fifth Semester

Statistics — Main

Major Elective I — STOCHASTIC PROCESSES

(For those who joined in July 2016 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Collections of random variables that are indexed by a parameter such as time and space are known as

   (a) Random function

   (b) Random processes

   (c) Stochastic processes

   (d) All the above

2. A stochastic process $\{X(t), t \in T\}$ is called second order processes if

   (a) $E\{X(t)\}^2 < \infty$ (b) $E\{X(t)\}^2 > \infty$

   (c) $E\{X(t)\} < \infty$ (d) $E\{X(t)\} = 0$

3. The conditional transition probability $P(X_n = a_j / Xn-1 = a_i)$ is called

   (a) One step transition probability from state a_i to state a_j

   (b) One step transition probability from state a_j to state a_i

   (c) n step transition probability from state a_i to state a_j

   (d) n step transition probability from state a_j to state a_i

4. Let $P_{jk} = P_k$ for all j, then the order of Markov chain is

   (a) 2

   (b) 0

   (c) 1

   (d) n

5. A Presistent non-null and aperiodic state of Markov Chain is said to be
   (a) Mean recurrence time
   (b) Ergodic
   (c) Irreducible
   (d) Transient

6. A state 'i' is said to be presistent or recurrent if the return to state i is certain if
   (a) $F_{ii} = 1$ (b) $F_{ii} < 1$
   (c) $F_{ii} < \infty$ (d) $F_{ii} = 0$

7. Mean of Yule-Furry process is
   (a) $e^{\lambda^2 t^2}$ (b) $e^{\lambda^2 t}$
   (c) $e^{\lambda t}$ (d) $\lambda e^{\lambda t}$

8. The inter arrival time of a poisson process with parameter λ follows an exponential distribution with mean.
   (a) $\lambda^2 + \lambda$
   (b) λ
   (c) $\frac{1}{\lambda^2}$
   (d) $\frac{1}{\lambda}$

9. The Art of Sport of fighting with a foil, saber or epee is

(a) Boxing (b) Fencing

(c) Wrestling (d) All the above

10. Mobility of Labour means

(a) More from one place to another place

(b) More from one occupation to another occupation

(c) More from one job to another job

(d) All the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the terms state space and parameter set associated with a random process with example.

Or

(b) Define :

(i) Martingale.

(ii) Sub-Martingale.

(iii) Super – Martingale.

12. (a) Explain the structure and visualize a transition probability of a Markov chain with example.

Or

(b) Let probability distribution X_0, X_1, X_2, X_3 can be computed interms of the transition probability P_{jk} and the initial distribution X_0 then show that $P_r\{X_0 = 1, X_1 = b. .. X_n = i, X_{n-1} = j, X_n = k\}$ = $\{P_r(X_0 = a)\} P_{ab} ... P_{ij}\ P_{jk}$.

13. (a) State and prove first entrance theorem.

Or

(b) Explain the concept of transient and recurrent state with example.

14. (a) Prove that sum of two independent poisson process is also poisson process.

Or

(b) Explain continuous time Markov Chain.

15. (a) Explain consumer behaviour.

Or

(b) Explain the recovery and data due to diseases.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Consider the process $\{X(t), t \in T\}$ whose probability distribution is given by

$$P\{X(t)=n\}=\begin{cases}\dfrac{at}{(1+at)} & n=0\\ \dfrac{(at)^{n-1}}{(1+at)^{n+1}} & n=1,2,3...\end{cases}$$

. Find mean and variance of $X(t)$.

Or

(b) Explain the following :

(i) Classification of stochastic process.

(ii) Wiener process.

17. (a) State and prove Chepman-Kolmogrov equation.

Or

(b) The TP matrix of a Markov chain $\{x_n\}$ with $n=1,2,3...$ having 3 states 1, 2, 3... is $P=\begin{pmatrix}0.1 & 0.5 & 0.4\\ 0.6 & 0.2 & 0.2\\ 0.3 & 0.4 & 0.3\end{pmatrix}$ and the initial distribution is $P^{(10)}=(0.7\ \ 0.2\ \ 0.1)$. Find $P(X_2=3)$ and $P(X_4=2, X_2=3, X_1=3, X_0=2)$.

18. (a) Discuss the communication relations and classification states of a Markov chain.

Or

(b) Find the nature of the states of the Markov chain with t.p.m.

$$P = \begin{array}{c} \\ 0 \\ 1 \\ 2 \end{array} \begin{array}{c} \begin{array}{ccc} 0 & 1 & 2 \end{array} \\ \begin{pmatrix} 0 & 1 & 0 \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{pmatrix} \end{array}$$

19. (a) Derive the probability distribution of Poisson process.

Or

(b) State the postulates of Birth and Death process and also obtain the difference differential equation.

20. (a) Explain the social mobility and industrial mobility.

Or

(b) Explain the Markov models in business and sports.

———————

(6 pages) **Reg. No. :** .....

Code No. : 11316 E **Sub. Code : GMSS 5 B**

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2018.

Fifth Semester

Statistics — Main

STOCHASTIC PROCESSES

(For those who joined in July 2012–2015)

Time : Three hours Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer :

1. Collection of random variable with time t is called _____.

   (a) Stationary process

   (b) Stochastic process

   (c) Wiener process

   (d) Poisson process

2. Sum of two independent Poisson process is ————————.

(a) Poisson process

(b) Stationary process

(c) Markov process

(d) All the above

3. Markov matrix is known as ————————.

(a) Row matrix

(b) Column matrix

(c) Transition Probability Matrix

(d) None of the above

4. Branching process also known as ————————.

(a) Galton Watson process

(b) Galton process

(c) Watson process

(d) Gaussian process

5. A state j is said to be persistent if ————————.

(a) $F_{jj} = 0$ (b) $F_{jj} = 1$

(c) $F_{jj} < 1$ (d) $F_{jj} > 1$

6. A Persistent non — null and aperiodic state of a Markov chain is said to be
   (a) Ergodic
   (b) Markov process
   (c) Stationary process
   (d) Poisson process

7. The Yule process is an example of a ————————.
   (a) Pure birth process
   (b) Pure death process
   (c) Poisson process
   (d) Birth process

8. The birth and death process can move to ————————.
   (a) n + 1 (b) n – 1
   (c) both (a) and (b) (d) none of the above

9. Mobility of labour means the capacity and ability of labour to move from ————————.
   (a) One place to another
   (b) One occupation to another
   (c) One job to another
   (d) All the above

10. The mobility of labour depend upon ————————.
   (a) Education (b) Training
   (c) Social setup (d) All the above

PART B — (5 × 5 = 25 marks)

Answer ALL questions.

Each answer should not exceed 250 words.

11. (a) Write a note on martingales with suitable example.

Or

(b) Explain state space and parametric space with an example.

12. (a) Explain the TPM with an illustration.

Or

(b) Explain Markov process with an illustration.

13. (a) Describe the Reducible and Irreducible Markov Chain.

Or

(b) Show that the following matrix is ergodic.

$$P = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ \frac{1}{4} & \frac{1}{8} & \frac{1}{8} & \frac{1}{2} \end{pmatrix} \end{array}$$

14. (a) State the Postulates of birth and death process.

Or

(b) Explain the Yule process with properties.

15. (a) Write a note on social mobility.

Or

(b) Explain the concept of credit risks.

PART C — (5 × 8 = 40 marks)

Answer ALL questions.

Each answer should not exceed 600 words.

16. (a) Explain the following with an illustration:

(i) Poisson Process

(ii) Stationary Process.

Or

(b) Briefly explain the classification of stochastic process.

17. (a) Show that one-dimensional random walk is a Markov chain. Also obtain its TPM.

Or

(b) Derive the mean and variance of Branching Process.

18. (a) Explain the following state:

(i) Recurrent (ii) Transient (iii) Ergodic.

Or

(b) Explain in detail about classification of states.

19. (a) Show that the interval between two successive occurrences of a Poisson process {N (t)} having parameter λ has a negative exponential distribution with mean $1/\lambda$.

Or

(b) Derive the backward differential equations for the Birth-Death process.

20. (a) Explain the following:

(i) Social and behavioural process

(ii) Industrial mobility labour.

Or

(b) Write a note on Markov model of business and sports.

———————