Anekant Education Society's

Tuljaram Chaturchand College of

Arts, Science and Commerce, Baramati

(Autonomous)

QUESTION BANK

FOR

F.Y.B.Sc. Sem - II

STATISTICS

STAT 1201: DESCRIPTIVE STATISTICS - II

(With effect from June 2019)

UNIT 1: Bivariate Data Analysis

A) Correlation

A) Questions for 1 mark

I] Choose the correct alternative

1. Correlation measures the extent of

   a) parabolic relation between two variables

   b) linear relation between two variables

   c) logarithmic relation between two variables

   d) exponential relation between two variables

2. Karl Pearson's coefficient of correlation lies between

   a) 0 to 1   b) -1 to 1   c) 0 to ∞ d) $-\infty$ to ∞

3. If the Karl Pearson's coefficient of correlation between X and Y is -1 then

   a) $Y \infty \dfrac{1}{X}$ b) $Y = a + bX + cX^2$

   c) $Y = a + bX, a < 0, b < 0$ d) $Y = a + bX, b < 0$

4. The Karl Pearson's coefficient of correlation between X and Y is

   a) independent of change of origin

   b) independent of change of scale

   c) independent of change of origin and scale

   d) none of the above

5. If X= constant, then Corr (X, Y) is

   a) 1   b) -1   c) 0   d) indeterminate

6. If X and Y are independent variables then Corr(X, Y) is

   a) 1   b) -1   c) 0

   d) cannot be determined since the data set in not given

7. If X + Y = constant, then Corr (X, Y) is

   a) 1   b) -1   c) 0

   d) insufficient information, so cannot be determined

8. If the data set on (X, Y) is {(1, 6), (2, 7), (3, 8)} then Corr (X, Y) is

   a) 0   b) 1   c) -1   d) -1/2

9. If Corr (X, Y) = 0 then we conclude that

a) $\sigma_x = \sigma_y$ b) $\overline{X} = \overline{Y}$ c) there is no relationship between X and Y

d) there is no linear relationship between X and Y.

10. Suppose X = Height in feet, Y = Weight is pounds. If Corr(X, Y) = 0.8, what will be correlation coefficient if height is converted in inches and weight is converted in ounces (16 ounces = 1 pund)?

a) 0.8   b) -0.8   c) 0.8/16   d) 0.8×12

II) Sate whether the following statements are True or False

1. Correlation coefficient cannot be negative
2. Correlation coefficient gives the idea about the non-linear relationship between the variables.
3. Corr(X, Y) = Corr(X + a, X +b)
4. If Corr (X, Y) = r, then Corr(X, X + Y) = r
5. If X and Y are correlated then they are dependent.
6. If X and Y are uncorrelated then they are independent.
7. Karl Pearson's coefficient of correlation cannot be determined for qualitative variables.
8. If Corr(X, Y) = -1 then Y = a + bX, b < 0 holds.
9. Correlation coefficient is a unitless quantity.
10. Scatter diagram gives the idea about the functional relationship between the two variables.

III) Explain the terms

1. Correlation
2. Karl Pearson's coefficient of correlation
3. Convariance
4. Coefficients of determination
5. Scatter diagram

B) Questions for 2 marks

1. If Cov (X, Y) = 20 then find Cov (Y, X)
2. Find Cov (X, X), Cov (X, -X).
3. If Cov(X, Y) = 20 then find Cov (aX, bY).

4. If Corr (X, Y) = 0.8 then find Corr (X, -Y), Corr(X, X)

5. State the expression for Var (X + Y)

6. If X and Y are uncorrelated then show that Var (X + Y) = Var (X – Y).

7. If $\sigma_x^2 = k, \sigma_y^2 = 3$, Cov (X, Y) = 2, find Corr(X,Y)

8. Give a counter example to show that uncorrelated variables may be dependent.

9. Give an example where correlation coefficient is observed to be positive.

10. Give an example where correlation coefficient is observed to be negative.

11. state any two properties of Karl Pearson's coefficient of correlation.

12. State the limitations of Karl Pearson's coefficient of correlation.

13. State the limitations of scatter diagram as a measure of correlation.

14. State the situation where the variable are uncorrelated.

15. Does correlation coefficient descrimate the variables as cause or effect?

16. State the types of correlation for the following (i) Weight and blood pressure of individuals. (ii) Supply and price of vegetables.

17. What type of correlation do you except in the following situations (i) Production and price of commodity. (ii) Demand and production of commodity. (iii) Supply and price of a commodity. (iv) Speed of a car and distance required to stop the car after applying brakes.

18. Draw scatter diagram when X and Y have (i) high positive correlation (ii) high negative correlation (iii) perfect position correlation (iv) perfect negative correlation (v) no correlation non-linear relation s(vii) one of the variable is constant

C) Questions for 4 marks

1) Explain the terms : Covariance, correlation and bivariate data.

2) State the different measures of correlation and describe each of the measures in detail.

3) Describe scatter diagram and explain how it is used to measure correlation.

4) Sketch the scatter diagrams for the following situations :

   i) Positive correlation   ii) Negative correlation

   iii) Perfect negative correlation   iv) Perfect positive correlation

   v) No correlation   vi) Non-linear correlation

   vii) No correlation due one of the variable being constant.

5) State merits and demerits of scatter diagram as measure of correlation.

6) Define correlation coefficient 'r'. State its merits and demerits. How will you interpret the cases (i) r = + 1, (ii) r = -1 (iii) r = 0?

7) Show that Karl Pearson's coefficient of correlation is invariant under the change of origin and scale.

8) Show that Karl Pearson's coefficient of correlation lies between -1 and +1.

9) What is rank correlation?

10) Define Spearman's rank correlation coefficient and derive an expression for it.

11) Compare merits and demerits of Karl Pearson's coefficient of correlation.

D) Questions for 6 marks

1) Compute correlation coefficient between income and expenditure from the following data

Year	1981	1982	1983	1884	1885	1886	1887	1888
Daily income(₹)	100	110	115	120	125	130	132	140
Average daily expenditure(₹)	85	90	92	100	110	125	125	130

2) From the following data of marks in Mathematics and Statistics, calculate correlation coefficient and interpret the result.

Marks in Statistics	60	70	80	90	10	20	30	40	50
Marks in Mathematics	65	70	80	75	45	40	50	60	55

3) Weekly income and savings in ` for 10 employees in a certain company are given below:

Income	250	750	820	900	780	360	980	390	650	620
Saving	60	68	62	86	84	51	91	47	53	58

Compute Karl Pearson's coefficient of correlation between income and savings.

4) A computer while calculating the correlation coefficient between two variable and y gave the following information

n = 25, $\sum x = 125$, $\sum y = 100$, $\sum x^2 = 650$, $\sum y^2 = 460$, $\sum xy = 508$. It come to know while checking that the operator had copied down two pairs of observations as:

X	6	8
Y	14	6

whereas correct values were

X	8	6
Y	12	8

Obtain the correct value of correlation coefficient between x and y.

5) Karl Pearson's coefficient of correlation between X and Y obtained from 10 pairs of items is 0.5. Means of X and Y are 12 and 15 respectively. Standard deviation of X and Y are 3 and 4 respectively. While checking it was noticed that one of the items was wrongly entered as 16 instead of 26 for x series and as 9 instead of 18 for y series. Calculate correct coefficient of correlation.

6) Given that : $r = 0.4$, $\sum (x - \bar{x})(y - \bar{y}) = 108, \sigma_y = 3 \, and \, \sum (x - \bar{x})^2 = 900$. Find number of pairs of observations.

7) Find number of pairs of observations from the following data.
$$r = -0.4, \sum x^2 = 2250, \sum y = 100, \sum y^2 = 2250, \sum xy = 1900$$

8) Find correlation coefficient between x and y given that : $n = 8$,
$$\sum (x - \bar{x})^2 = 36, (y - \bar{y})^2 = 44, \sum (x - \bar{x})(y - \bar{y}) = 24$$

9) Find coefficient of correlation from the following information.
$$n = 10 \sum (x - 30) = 11, (y - 25) = 7, \sum (x - 30)^2 = 215, (y - 25)^2 = 163, \sum (x - \bar{x})(y - \bar{y}) = 186$$

10) Given $n = 6, \sum (x - 18.5) = -3, \sum (y - 50) = 20, \sum (x - 18.5)^2 = 19, \sum (y - 50)^2 = 850,$
$\sum (x - 18.5)(y - 50) = -120$. Calculate coefficient of correlation.

11) Calculate coefficient of correlation from the following information
$$n = 5, \sum x = 20, \sum x^2 = 90, \sum y = 20, \sum y^2 = 90, \sum xy = 73$$

12) Given

Number of pairs of X and Y series	= 15
Arithmetic mean of X	= 25
Arithmetic mean of Y	= 18
Standard deviation of X	= 3
Standard deviation of Y	= 3
Sum of product of X and Y ($\sum XY$)	= 6870

Find correlation coefficient between X and Y.

13) From the following data compute the coefficient of correlation:

Number of pairs of observations = 10

Sum of X series = 9

Sum of Y series = 5

Sum of squares of X series = 653

Sum of squares of Y series = 595

Sum of product of X and Y series = 534

14) From the following data compute the coefficient of correlation between X and Y.

Number of pairs of observations = 10

Sum of deviations X series = -170

Sum of deviations Y series = -20

Sum of squares of deviations X series = 8000

Sum of squares of deviations Y series = 2000

Sum of product of deviations X and Y series = 2500

15) Coefficient of correlation between variable X and Y is 0.3 and their covariance is 12. The variance of X is 9, find the standard deviation of Y.

16) Draw a scatter diagram for the following data and interpret.

Height(inches)	72	60	63	66	70	65	58	68	72	62
Weight(kg)	65	54	55	61	60	54	50	63	65	50

17) Six entries in a music contest were rated by two judges X and Y as follows:

Ranks by X	5	6	4	3	2	1
Ranks by Y	6	2	1	3	4	5

Obtain rank correlation coefficient.

18) Spearman's rank correlation coefficient between X and Y is 2/3. If the sum of squares of differences between ranks is 55, assuming that no rank is repeated, find the number of pairs in the series.

19) Spearman's rank correlation coefficient between the marks in English and marks in Statistics for a group of students in 0.5. If sum of the squares of the differences between ranks is 42, find the number of students in the group. Assume that no rank is repeated.

20) The spearman's rank correlation coefficient between the marks obtained by 10 students in

mathematics and statistics is 0.5. It was later discovered that the difference in ranks in two subjects obtained by one of the student was wrongly taken as 3 instead of 7. Find the correct value of rank correlation coefficient.

21) Ten competitors in a beauty contest are ranked by three judges in the following order.

Judge A	6	1	10	5	2	3	9	4	7	7
Judge B	5	3	4	8	10	7	1	2	6	9
Judge C	4	6	8	9	2	1	10	3	5	7

Use the rank correlation coefficient to determine which pair of judges has the nearest approach to common tastes in beauty.

22) The scores obtained by 11 candidates in drawing (X) and in music (Y) are given below:

Candidate	A	B	C	D	E	F	G	H	I	J	K
X	24	29	19	14	30	19	27	30	20	28	11
Y	37	35	16	26	23	27	19	20	16	11	21

Compute Spearman's rank correlation between X and Y.

23) Suppose x, y, z are uncorrelated variables having same arithmetic means and variances.

Find (i) $Corr(x, x+y)$ (ii) $Corr\left(x, \dfrac{x+y}{2}\right)$ (iii) $Corr(x+y, y+z)$

(iv) $Corr(x+y, y-z)$ (v) $Corr(ax+by, bx+ay)$

24) Obtain the expression for following:

$Var(ax+by+c)$ and $Var\left(\dfrac{x+y+z}{3}\right)$ in terms of variances and correlations.

25) If $\sigma_x = \sigma_y, Corr(x, y) = r$, then show that $Corr(x, x+y) = \sqrt{\dfrac{1+r}{2}}$

B) Regression

A) Questions for 1 mark

I] Choose the correct alternative

1. If the Corr(X, Y) = 0 then the regression lines will be

   a) parallel to each other

   b) perpendicular to each other

   c) coincident

   d) none of the above

2. The two regression lines intersect at

   a) (0, 0)   b) (σ_x, σ_y) c) $(\overline{X}, \overline{Y})$ d) none of the above

3. If the two regression lines are coincident then

   a) $b_{xy} = b_{yx}$ b) $b_{xy} = \dfrac{1}{b_{xy}}$ c) $b_{xy} = -b_{yx}$ d) none of the above

4. If the correlation coefficient r = ± 1 then the regression lines

   a) are parallel   b) are coincident

   c) are perpendicular to each other   d) do not exist

5. The regression coefficient of b_{yx} is given by

   a) $r\dfrac{\sigma_y}{\sigma_x}$ b) $r\dfrac{\sigma_x}{\sigma_y}$ c) $\dfrac{\sum xy - n\overline{x}\,\overline{y}}{\sigma_x \sigma_y}$ d) $\dfrac{\sum xy - n\overline{x}\,\overline{y}}{n}$

6. The regression coefficient have

   a) the same algebraic sings   b) the opposite algebraic sings

   c) always positive signs   d) always negative signs

7. The regression coefficients are always

   a) reciprocals of each other   b) equal numerically

   c) opposite in algebraic sings   d) none of the above

8. If X is in measured in cm and Y is measured in kg then the units of

   a) b_{yx} is cm/kg   b) b_{yx} is kg/cm   c) b_{yx} is kg/cm^2 d) b_{yx} is unitless

9. If $b_{yx} = b_{xy}$ then

a) r = 1   b) r = -1   c) r = 0   d) $\sigma_x = \sigma_y$

10. If U = 2X and V = 3Y then

a) $b_{UV} = 6b_{xy}$ b) $b_{UV} = \dfrac{3}{2}b_{xy}$ c) $b_{UV} = \dfrac{2}{3}b_{xy}$ d) $b_{UV} = \dfrac{1}{6}b_{xy}$

II] State whether the following statements are True or False :

1. The algebraic sings of b_{xy}, b_{yx} and r are same.

2. The correlation coefficient is a geometric mean of regression coefficient.

3. With usual notation, $\left|\dfrac{b_{xy} + b_{yx}}{2}\right| \le |r|$ holds.

4. If $r = \pm 1$ then the regression coefficients are reciprocals of each other.

5. It is possible to have $b_{yx} = 2$, $b_{xy} = 1.3$.

6. If X and Y are independent then the regression coefficients are zero.

7. If $\sigma_x = \sigma_y$ then $b_{xy} = b_{xy}$.

8. The regression lines never intersect.

9. The point $(\overline{X}, \overline{Y})$ is a point of intersection of the two regression lines.

10. The regression coefficient are independent of change or origin and scale.

III) Answer the following (1 mark each)

1. If $b_{xv} = 0.4$, $b_y = 1.6$ then find r.

2. If $b_{xy} = 0.8$ U = 2X, V = -2Y then find b_{uv}.

3. If Y = 2X – 3 is a regression line of Y on X then find b_{yx}.

4. If $\sigma_x = 1$, $\sigma_y = 2$, r = 0.7 find b_{yx} and b_{xy}.

5. Given the two regression lines Y = 4x and Y – X = 6, find $\overline{X}, \overline{Y}$

6. Given $\sigma_x = 1$, $\sigma_y = 2$, r = 0.7 find Cov (X, Y).

7. Given Cov (X, Y) = 20, $\sigma_x = \sigma_y = 5$, find r.

8. If the regression line of Y on X is 2Y = 3X — 6 then find the estimate Y for X =10.

9. If n = 10 find the standard error of r given that r = 0.8.

10. State the normal equation to fit $Y = ab^x$ using least square principle.

B) Questions of 2 marks

1. For a bivariate data, $\overline{x} = 53$, $\overline{y} = 28$, $b_{yx} = 1.5$ and $b_{xy} = - 0.2$. Estimate y for x = 50

2. Explain the terms linear regression, regression coefficient of y on x and regression coefficient of x on y. Also, state any two properties of the regression coefficients.

3. State the normal equations for estimating a and b in the line of regression $y = a + bx$.

4. Interpret each of the following
   (a) Coefficient of regression of Y on X is 4.2.
   (b) Coefficient of regression of X on Y is 0.5.

5. If $\overline{X} = 5$, $\overline{Y} = 3$ and $b_{yx} = 0.6$, obtain the regression estimate of Y for X = 3.

6. State the normal equations to fit $Y = b^x$.

7. Comment on validity of the following data for a bivariate data
   $r_{xy} = 0.9$, $b_{xy} = 2.04$, $b_{yx} = -3.2$.

8. If $b_{yx} = -1.8$, $b_{xy} = -0.2$ and variance (X) = 4. Find the standard deviation of Y and covariance between X and Y.

9. State the normal equation to fit (i) $Y = ab^x$ (ii) $Y = a + bx + cx^2$ (iii) $Y = aX^b$

   (iv) $Y = ae^x$ (v) $Y = \dfrac{1}{a+bx}$ using least square principle.

10. The two lines of regression are $x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$.
    (i) Compute the correlation coefficient between x and y.
    (ii) Estimate x when y = 2.5

11. For a bivariate data, the regression equations are:
    $4x - 5y + 33 = 0$ and $20x - 9y = 107$.
    Find means of x and y. Find correlation coefficient between x and y. Also, estimate y when x = 10.

12. For a certain bivariate data the least square lines of regression are $4y - x = 19$ and $9x - y = 39$, obtain :
    (i) regression coefficient of X on Y.
    (ii) regression coefficient of Y on X.
    (iii) correlation coefficient between X and Y.

13. The equations of the two regression lines are: $2x + 3y - 6 = 0$ and $5x + 7y - 12 = 0$.
    Find (a) Correlation coefficient and   (b) σ_x / σ_y

14. For 50 students of a class, the regression equation of marks in Statistics (x) on marks in Accountancy (y) is $3y - 5x + 180 = 0$. The mean marks in Accountancy is 44 and

variance of marks in Statistics is 9/16th of the variance of marks in Accountancy. Find mean marks in Statistics. Also, find coefficient of correlation between marks in two subjects.

15. For a bivariate data x and y, the regression equations to two lines of regression are $3x - 2y + 1 = 0$ and $3x - 8y + 13 = 0$. Predict the value of y for x = 4 and value of x for y = 3.

C) Questions for 4 marks

1. Define the regression coefficients.

2. State the equations of regression lines.

3. State the expressions for the acute angle between the regression fine,

4. State the point of intersection between the two regression lines,

5. State the conditions to get coincident regression lines.

6. State the relationship between regression coefficients and correlation.

7. Derive the expressions for regression lines of y on x.

8. Define regression coefficients and state the properties.

9. Distinguish between regression coefficients and correlation coefficient.

10. Define coefficient of determination and state its utility.

11. Explain the procedure of fitting the following curves :

    (i) $y = a + bx + cx^2$,   ii) $y = ab^x$; a >0, b>0,

12. Show that r, b_{yx} and b_{xy} have same algebraic sign.

D) Questions for 6 marks

1) Determine the two regression lines from the following data

x	7	6	10	14	13
Y	22	18	20	26	24

2) Following data are related to marks in Accountancy (x) and marks in Statistics (y) of 10 candidates.

X	66	65	68	68	67	66	70	64	69	67
Y	68	67	67	70	65	68	70	66	68	66

i) Calculate regression coefficients, hence correlation coefficient.

ii) Estimate marks in Statistics of a student who has scored 76 marks in Accountancy.

iii) Estimate marks in Accountancy of a student who has obtained 60 marks in Statistics.

3) Following are the data of retail food price index (X) and wholesale food price index (Y) for 10 years.

X	89	86	74	65	65	63	66	6	72	79
Y	92	91.5	84	75	73.5	72	70.5	75	77.5	84

Find the regression lines. Hence find correlation coefficient.

4) The following data give the sales and expenses of 10 firms.

Firm No.	1	2	3	4	5	6	7	8	9	10
Sales (in '000 ₹)	45	70	65	30	90	40	50	75	85	60
Expenses (in '000 ₹)	35	90	70	40	95	40	60	80	80	50

Obtain the least square regression line of expenses on sales. Estimate expenses if sales are ₹. 75000. Also draw residual plot. Find the residual sum of squares.

5) A panel of examiners A and B assessed 7 candidates independently and awarded the following marks.

Candidate	1	2	3	4	5	6	7
Marks By A	40	34	28	30	44	38	31
Marks by B	32	39	26	30	38	34	28

Eighth candidate was awarded 36 marks by examiner A. Using least square regression line estimate the marks awarded by the examiner B.

6) The failure of a certain electronic device is suspected to increase linearly with its temperature, Fit a least square regression line through the following data :

Temperature ^0F	55	65	75	85	95	105
Failure rate 10^{-6}	1.90	1.93	1.97	2.00	2.01	2.01

Also predict the failure rate at 70°C. Also draw residual plot and find the residual sum of squares.

7) In a study of correlation between the amount of rainfall (x) and corrosion of iron building material (y) measured in suitable units, the following data were recorded.

x	4.3	4.5	5.9	5.6	6.1	5.2	3.8	2.1	7.5	7.0
y	86	90	115	102	122	100	76	50	145	135

where x is average rainfall in 0.01 inch.

(i) Compute correlation coefficient between x and y and interpret the result.

(ii) Estimate y for x = 8 using regression line.

8) Find the correlation coefficient between population density (x) and pollution (y)

measured in suitable units for the following data

x (in lakhs)	11	12	13	14	15
Y	0.50	0.52	0.60	0.68	0.80

Also interpret the result.

9) Given the following information:

Mean height $\left(\overline{X}\right)= 1205$cm,   Mean age $\left(\overline{Y}\right)= 10.37$ years

     S. D. of X = 12.7 cm,   S. D. of Y = 2.39 years

Correlation coefficient between X and Y = 0.93

i) Fit the two regression lines.

ii) Estimate the height of a boy of 12 years.

10) Following is the information about the bivariate frequency distribution :

n = 20, $\sum x = 80$, $\sum x = 40$, $\sum x^2 = 1680$, $\sum y^2 = 320$, $\sum xy = 480$.

i) Obtain the regression lines.

ii) Estimate y for x = 3 and estimate x for y =3.

11) You are given the following information about two variables x and y.

n = 10, $\sum x^2 = 385$, $\sum y^2 = 192$, $\overline{x}=5.5$, $\overline{y} = 4$, $\sum xy = 185$

Find (i) Regression line of y on x.   (ii) regression line of x on y

     (iii) Standard error of regression estimate of y on x.

12) Compute regression coefficient from the following data:

n = 8, $\sum (x - 45) = -40$, $\sum (x - 45)^2 = 4400$, $\sum (y - 150) = 280$,

$\sum (y - 150)^2 = 167432$, $\sum (x - 45)(y - 150) = 21680$

13) From the following data, obtain the yield when the rainfall is 29 inches.

	Rainfall (inches)	Yield (per acre)
Arithmetic Mean	27	40
Standard deviation	3	6

Correlation coefficient between rainfall and yield is 0.8

14) For a bivariate data we have $\overline{X} = 53, \overline{Y} = 28, b_{yx} = -1.5, b_{xy} = -0.2$

Find (i) correlation coefficient between X and Y

     (ii) estimate of y for x = 60

     (iii) estimate of x for y = 30

15) The regression equations are 3x – y – 5 = 0 and 4x – 3y = 0. Find

i) Arithmetic mean of x and y.

ii) Coefficient variations of x and y, if $\sigma_x = 2$.

iii) Correlation coefficient between x and y.

16) The following results were obtained from records of age (X) and systolic blood pressure (Y), of a group of 10 men:

	X	Y
Mean	53	142
Variance	130	165

$$\sum(x-\bar{x})(y-\bar{y})=1220$$

Find the appropriate regression equation and use it to estimate the blood pressure of a man with age 45 years.

17) The two regression equations of variables x and y are x = 19.13 – 0.87 y and y = 11.64 – 0.5 x. Find $\bar{x}, \bar{y}$ and Corr (x, y).

18) The regression equations are given by 8x – 10y + 66 = 0 and 40x – 18y – 214 = 0. Find $\bar{x}, \bar{y}$ and Corr (x, y). Also find σ_y given that $\sigma_x = 3$.

UNIT 2: Theory of Attributes

A) Questions for 1 mark

I] Choose the correct alternative

1. Attribute is ………….

a) a quantitative characteristics

b) a measureable characteristics

c) a qualitative characteristics

d) none of the above

2. Which of the following is not an example of attribute?

a) literacy

b) intelligence

c) blindness

d) number of pages in a book

3. If we divide the observations into more than two groups, the sub-division is called as……….

a) Autonomous classification

b) Dichotomous classification

c) Manifold classification

d) None of the above

4. Classification according to grades obtained in an examination is an example of ….

a) Dichotomous classification

b) Autonomous classification

   c) Manifold classification   d) None of the above

5. Which of the following is an example of attribute characteristics?

   a) Height   b) Weight   c) Wages   d) Blood group

6. The number of observations belonging to a particular class is known as…….

   a) Order of class   b) Negative class   c) Class frequency   d) none of these

7. With three attributes the total number of class frequencies of all orders is equal to…..

   a) eight   b) nine   c) twenty seven   d) none of the above

8. Ultimate class frequencies means the frequencies of the classes of………..

   a) zero order   b) lowest order   c) highest order   d) none of the above

B) Questions for 2 marks

1. Define the term dichotomy & manifold classification
2. Comment on the association between the attributes A & B in each of the Following :-
    i) N= 100 (A) =75 (B)=60 (AB) =40 ii) N= 100 (A) =60 (B)=50 (AB) =20
3. Define variable and attribute
4. From the following ultimate class frequencies, compute remaining Frequencies (AB)=13, (Aβ) = 20 , (αB)= 15 , (αβ) =9
5. If N=200, (A) =150, (B) =100, (AB)=80 find (A) &(B).
6. Define positive and negative attribute.
7. Find the total no of class frequencies in case of two attribute.
8. Define the order of class.
9. If N=100 , (A) =550 , (B) =700 , &(AB) =300 find (αB) , (αβ).

C) Questions for 4 marks

1. Show that co-efficient of association lies between -1 to 1
2. Define method of operation N. with example

    ii) Explain i) positive and negative attribute ii) Ultimate class frequency
4. Define completely associated and dissociated of two attribute A& B
5. Define i) fundamental set of class frequency ii) Ultimate class frequency
6. Define association and independence of two attribute
7. If (A) = (B) = 4 , N = 8 obtain the co-efficient of association for each of the following cases i) (AB) =0 ii) (AB) = 1

8. If the attribute A&B are independent then show that i)A and β ii) α and β are independent.

9. If Q is the Yule's coefficient between two attribute interpret the values Q=0, Q=1, Q= -1

10. In a certain interview there were 126 candidates of which 70 were boys, 36 candidates were successful among them 20 were boys obtained the co-efficient of association between and attribute boy.

11. Find the co-efficient of association between education standard and Employment from data and comment on result.

	Employed	Unemployed
Graduate	572	96
Non-Graduate	900	432

12. Out of 600 persons in a locality 150 attacked by cholera. In all were inoculated against cholera of whom only 14 were attacked. Comment on the effectiveness of inoculation in preventing cholera As indicated by co-efficient of association

C) Questions for 6 marks
1. Define raw and central moments of series of individual observation.

2. Explain the following

   a) Positive and negative attribute

   b) Order of the class

   c) Ultimate class frequencies

   d) independence of two attribute

   e) Positive and negative association

   f) Fundamental set of class frequency

4. Define the coefficient of association Q and interpret the case $Q = 0$, $Q = 1$

5. Show that coefficient of association Q lies between -1 and 1

6. From the following ultimate class frequencies compute remaining frequency (AB) =13,(A β)=10 ,(αB)=9, (α β)=7.

7. The following are data on literacy and criminal tendency in a town Total population (in thousands)=224

   Total literates (in thousands) =40 Literate criminals (in hundreds) =03

Illiterate criminals (in hundreds)=43

Find the association between literacy and criminal tendency and comment.

UNIT 3: Demography

A) Questions for 1 mark

I] Choose the correct alternative

1. Vital statistics is a branch of biometry which deals with data and laws of

    (a) marriages   (c) deaths

    (b) births   (d) all the above

2. The study of vital statistics relited with

    (a) population growth   (b) virility of races

    (c) changing pattern of the population during intercensal period

    (d) all the above

3. The wide use of vital statistics is in the field of

    (a) planners   (b) social reforms

    (C) actuaries   (d) all the above

4. The practical use of vita! events in India started for the first time in :

    (a) 1786   (c) 1946

    (b) 1886   (d) 1961

5. The collection of information (rata) about each and every individual of a country is known as

    (a) vital statistics   (c) census

    (b) demography   (d) none of the above

6. In India, the registration of vital statistics suffers from

    (a) lack of accuracy   (b) incomplete coverage

    (c) incomplete reporting   (d) all the above

7. In a country, the registration of vital events such as births, deaths and marriages are :

    (a) a sample of medical research (b) a fancy of society

    (c) a legal document   (d) all the above

8. Population statistics throws light on

(a) record of morbidity   (b) record of population regions

(c) record of foetal deaths   (d) all the above

9. 9. The name of committee appointed by the central government in 1948, to improve upon the registration of vital statistics in India :

(a) Rath committee   (b) Arthur committee

(c) Bhor committee   (d) none of the above

10. The main organiser at the apex regarding registration of vital statistics is :

(a) census commissioner   (b) director general

(c) registrar general   (d) all the above

11. The responsible person for registration of vital statistics at state level is

(a) chief registrar   (b) chief returning officer

(c) director of economics and statistics   (d) none of the above

12. Which one of the following system deals with vital statistics?

(a) registration system   (b) survey method

(c) census method   (d) all the above

13. In rural area, the registration system of births and deaths by using sampling survey method came into operation in :

(a) 1966   (b) 1967

(c) 1968   (d) 1969

14. The registration of births and deaths act during post-independent India passed in :

(a) 1948   (b) 1959

(c) 1969   (d) 1979

15. Which one of the following year the sampling registration system of births and deaths in rural areas started ?

(a) 1967   (b) 1968

(c) 1969   (d) none of the above

16. Which one of the following fails to record in sampling registration system?

(a) birth rates   (b) death rates

(c) age and sex composition   (d) all the above

17. The advantage of sampling registration system is that : it provides

(a) more accurate information   (b) information having full coverage

(c) the estimates for rural and urban areas separately

(d) all the above

18. The analytical methods are based on assumption that :

(a) there is time lag　　　　　　　　　(b) the population is stangant

(c) the population grows at a constant rate

(d) none of the above

19. Population for intercensal year (or time t) can be estimated by the formula :

(a) $\hat{P}_t = P_0 + (B - D) + (I - E)$　　　　(b) $\hat{P}_t = (B - D) + (I - E)$

(c) $\hat{P}_t = P_0 + \{(B - D) + (I - E)\}$　　　(d) $\hat{P}_t = P_0 + (B - D) - (I - E)$

20. In vital statistics the rates of vital events are measured in :

(a) fraction　　　　　　　　　　　　(c) per thousand

(b) percentages　　　　　　　　　　(d) per million

21. Crude death rate provides the probability of

(a) drying a person during the year under reference

(b) babies borned and died during the year under reference

(c) a foatal death during the year under reference

(d) all the above

22. In India, the fertility age group of a woman is maximum in the:

(a) 15-20 years　　　　　　　　　　(b) 20-24 year

(c) 25-29 years　　　　　　　　　　(d) 15-29 years

23. Which one of the following rate is obtained for a segment of a population?

(a) crude death rate　　　　　　　　(b) standardised death rate

(c) vital index　　　　　　　　　　(d) specific death rate

24. In India, the child bearing age is :

(a) 20-24 years　　　　　　　　　　(c) 13-48 years

(b) 15-49 years　　　　　　　　　　(d) 20-29 years

25. For the babies of age less than one year, the age-specific death rate specifically called:

(a) infant mortality rate　　　　　　(b) foetal death rate

(c) maternal mortality rate　　　　　(d) none of the above

26. Age specific mortality rates fail to reveal :

(a) sex ratio

(b) age distribution of persons

(c) mortality conditions

(d) all the above

27. Which one of the following death rate is used for comparison of death rates of two regions ?

(a) crude death rate

(b) standardised death rate

(c) foetal death rate

(d) none of the above

28. The birth rates of fertility rates mainly depend on:

(a) total population

(b) number of newly borned babies

(c) total female population

(d) female population of child bearing age

29. The basis for family planning is provided by :

(a) total marital fertility rate

(b) total fertility rate

(c) general fertility rate

(d) age specific marital fertility rate

30. Adequate basis for fertility rates is provides by :

(a) checking the infant mortality

(b) family planning

(c) population growth

(d) all the above

31. Total fertility rates provides the basis for :

(a) population increase in a desired period

(b) population projection

(c) the expected maximum family size

(d) all the above

32. Population growth mainly depends on:

(a) number of female births

(b) number of male births

(c) total number of births

(d) none of the above.

33. In general, the measurement of survival rate is:

(a) the ratio of the difference total births and total deaths to the mean population

(b) the difference in crude birth and death rate

(c) neither (a) or nor (b)

(d) both (a) and (b)

34. The ratio of births to the total deaths in a year is called

(a) vital index

(b) population death rate

(c) total fertility rate

(d) survival rate

35. For asserting population growth vital index is:

(a) useless

(b) a good measure

(c) a rough measure

(d) none of the above

36. The word 'Gross' in the Gross reproduction rate stands for:

(a) it is based on unrealistic assumptions

(b) it is based on clumsy grounds

(c) its basis is hypothetical

(d) all the above

37. Gross reproduction rate have drawback of:

(a) the neglect of the number of unmarried women

(b) diverces are not under considerations

(c) assumption of no mortality of female childrens till their tacundity age

(d) all the above

38. Net reproduction rate (N.R.R.) is more viable than gross reproduction rate (G.R.F because

(a) it utilises survival rate

(b) it makes use of life tables

(c) fertility rates as well as mortality rates are under consideration

(d) all the above

39. Which one of the follcv,;:ng is true?

(a) N.R.R. is generally greater than G.R.R.

(b) N.R.R. and G.R.R. usually equal

(c) N.R.R. can never exceed G.R.R.

(d) none of the above

40. When N.R.R. = 1 then we interpret that:

(a) population remains constant.

(b) female population will exactly replace it self.

(c) there is no mortality in female.

(d) all the above.

41. If N.R.R. = 1 then there is:

(a) increase in population

(b) zero increase in population

(c) negative increase in population

(d) none of the above

42. If N.R.R. < 1 then we say that there is

(a) reduction in population

(b) constancy in population

(c) increase in population

(d) all the above

43. Which one of the following is true for NRR?

(a) It is not true in real life for N.R.R. that age S.F.R, are taken as constant.

(b) Migrants are not the subjects of N.R.R. which is not correct.

(c) The basis of using constant fertility and mortality rates is not very appropriate.

(d) All the above.

44. The ratio of the number of children of age less than five years to the total number of woman of 15-49 year age is called.

(a) replacement index.

(b) vital index.

(c) net reproduction rate.

(d) gross reproduction rate.

45. The ratio of annual net migration to the annual mean population provides:

(a) net migration rate

(b) population growth rate

(c) vital index

(d) none of the above

46. The rates based on unemployment are similar to:

(a) death rates

(b) survival rates

(c) migration rates

(d) none of the above.

47. A population which has a constant growth rate is called as a:

(a) stationary population

(b) mobile population

(c) stable population

(d) none of the above

48. Mortality condition or health conditions of persons in two towns are compared by I

(a) specific death rate

(b) crude death rate

(c) standardised death

(d) none of the above

49. For unknown specific death rate, the standardised death rate :

(a) is the C.D.R. x adjustment factor

(b) is equal to C.D.R.

(c) can not be calculated

(d) none of the these

50. Life table also named as

(a) life expectancy table

(b) survival table

(c) mortality table

(d) all the above

51. C.D.R. is usually observed between

(a) 3 and 23

(b) 15 and 44

(c) 10 to 55

(d) less than 1

52. Which one of the following is true for C.D.R.?

(a) It ignores age and sex distribution.

(b) It can be used only for comparison of mortality of two places when age and sex distributions are more or less same.

(c) It differs for different locality, occupation.

(d) All above true.

53. C.D.R. of India, target value for the year 2000 was :

(a) 8   (b) 9   (c) 10   (d) 11

54. The specific death rates may be according to:

(a) age and sex   (b) locality or region

(c) specific cause and occupation   (d) all the above

55. If D : Annual deaths and P : Annual mean population then formula for calculating C.D.R. is

(a) $\dfrac{D}{P} \times 100$ (b) $\dfrac{D}{P} \times 1000$

(c) $\dfrac{P}{D} \times 1000$ (d) $\dfrac{P}{D} \times 100$

56. If D_i = number of deaths in i^{th} age group P_i = Total population of ith age group then formula for age specific death rate for the ith age group is

(a) $m_i = (D_i \times P_i)/1000$ (c) $m_i = D_i \times P_i \times 1000$

(b) $m_i = (D_i/P_i) \times 1000$ (d) $m_i = D_i/P \times 100$

57. If age specific death rate for ith age group mi is known then C.D.R. can be computed by formula

(a) $C.D.R. = \sum m_i P_i / \sum P_i$ (b) $C.D.R. = \sum (m_i P_i) / \sum P_i$

(c) $C.D.R. = \sum m_i P_i / \sum m_i$ (d) $C.D.R. = \sum m_i / \sum P_i$

58. Crude birth rate (C.B.R.) for per thousand generally lies between :

(a) 3 to 23   (b) 15 to 24   (c) 10 to 55   (d) less than 1.

59. The disadvantage of C.B.R. is

(a) it ignores age and sex distribution   (b) it underestimates fertility rate

(c) it provides very approximate fertility rate   (d) all of the above

60. If B = total live births and Pf = total female population in the reproductive age group then formula for General fertility rate is:

(a) G.F.R. $(B/P^f) \times 100$ (b) G.F.R. = $(B/P^f) \times 1000$

(c) G.F.R. $(P^f / B) \times 100$ (d) G.F.R. $(P^f / B) \times 1000$

61. If B_i = number of birthds to the females in the ith age group and P_i^f = female population i^{th} age group then (formula for) age specific fertility rate is:

(a) $A.S.F.R. = \left(B_i / P_i^f \right) \times 1000$

(b) $A.S.F.R. = \left(B_i \times P_i^f \right) \times 1000$

(c) $A.S.F.R. = \left(B_i / P_i^f \right) \times 100$

(d) $A.S.F.R. = \left(P_i^f / B_i \right) \times 1000$

62. If C is the width of an age group, then formula to obtain total fertility rate is:

(a) T.F.R. $= \subset \Sigma(\text{A.S.F.R.})$

(d) T.F.R. $= \Sigma(\text{A.S.F.R.})^{\subset}$

(c) T.F.R. $= \subset/\Sigma(\text{A.S.F.R.})$

(d) T.F.R. $= \subset \Sigma(\text{A.S.F.R.})/1000$

63. Which one of the following is a limitation of T.F.R.?

(a) It does not consider effect of infertility

(d) Entire female population in the reproductive age period under consideration

(c) All the women still survive upto the end of the reproductive age period.

(d) All the above

64. If $\pi_i \, (0 \le \pi_i \le 1)$ is the survival factor of females in the ith age group,

B_i^f = number of female birthds,

P_i^f = female population of ith age group then formula to find Net reproduction rate is

(a) $N.R.R. = \left(\text{width of age group} \right) \times \sum \dfrac{B_i^f}{P_i^f} \times \pi_i \times 1000$

(b) $N.R.R. = \left(\dfrac{\text{width of age group}}{\pi_i} \right) \times \sum \dfrac{B_i^f}{P_i^f} \times 1000$

(c) $N.R.R. = \left(\text{width of age group} \right) \times \pi \sum \dfrac{B_i^f}{P_i^f} \times 1000$

(d) none of the above

[B] State Whether the following statements are True or False :

1. Vital statistics deals with study of births, deaths marriages etc.

2. In India, collection of information regarding vital events started first time in 1886.

3. Every seven year census survey is conducted.

4. The registration of Vital events are a legal document.

5. In 1948, Bhor committee appointed by the state government of Maharashtra to improve upon the registration of vital statistics.

6. The rates of vital events are measured in per million.

7. Census commissioner is responsible person for registration of vital statistics.

8. At the state level, chief registrar is the responsible person for registration of vital statistics.

9. At the state level, sample census system was implemented to estimate the births and deaths in India.

10. In rural areas, the sampling registration system started in 1968 D.

11. Age and sex composition fails to record in sampling registration system.

12. At the state level only the information on Infant mortality is collected.

13. During post independence the registration of births and deaths act passed in 1969.

14. With usual notations the formula of estimate of population for intercensal year (or time t) is

$$\hat{P}_t = P_0 + (B - D) + (I - E)$$

15. 15. Crude death rate provides the probability of surviving a person during the year under reference.

16. In India, 25 — 29 years is the maximum fertility age group of a woman.

17. Specific death rate is obtained for a segment of a population

18. In India the child bearing age of woman is 15-49 years.

19. Population growth does not depend on the sex of the new born babies.

20. Crude death rate is the probability of death of a person during the said period.

21. The age specific death rate for the babies of age less than one year is specifically called infant mortality rate.

22. Standardized death rates are not useful for comparing the death rates of two regions.

23. Fertility rates mainly depend on female population of child bearing age.

24. Adequate basis for fertility rates is provided by family planning.

25. NRR mainly depends on number of female births.

26. Standardized death rate is the pooled death rate of various categories of a population.

27. General fertility rate is based on women of all ages.

28. Age specific fertility rate does not provide better ground for family planning.

29. Vital index is the ratio of deaths to the total births in a year.

30. The difference in crude birth and death rate gives survival rate.

31. N.R.R. can exceeds G.R.R.

32. If N.R.R. > 1 then there is increase in population.

33. If N.R.R. < 1 then it is indicative of reduction in population.

34. A life table is a profile of human population.

35. The health conditions or mortality conditions of a person in two towns compared by standardized death rate.

36. For unknown specific death rate Standardised death rate = C.D.R. x Adjustment factor.

37. C.D.R. is usually observed between 15 and 44.

38. The target value of C.D.R of India is 11 for the year, 2000.

39. C.D.R. = D/P x 1000, where

   D = annual deaths and P = annual mean population

40. Age S.D.R. = D_i x P_i x 1000 where,

   D_i = number of deaths and P_i = Total population of ith age group.

41. Generally C.B.R. for per thousand lies between 10 to 55.

42. G.F.R. = B/P^f x 1000, Where B = total live births and P^f = total female population in the, reproductive age.

43. A life table is most utilized by life insurance company.

B) Questions for 2 marks

1) D Explain how S.T.D.R. is superior to C.D.R.

2) Explain the purpose of S.T.D.R.

3) Define G.F.R. and T.F.R.

4) Explain how G.F.R. is superior to C.B.R.

5) What is the utility of T.F.R.?

6) State various measures of fertility and compare them.

7) Explain what do you understand by C.B.R. and why it cannot be considered as an accurate measure of fertility. How it can be improved to give better results?

8) Describe indirect method of obtaining S.T.D.R.

9) Explain the term (i) infant mortality rate (ii) dependency ratio, (iii) sex ratio.

10) Describe the nature of age S.D.R.

11) Define reproduction rates. Explain how far they may be looked upon as indices of population growth.

C) Questions for 4 marks
1) Explain the terms : vital event, rate of vital event.

2) Explain the methods of collecting vital statistics.

3) Definite C.D.R. and C.B.R..

4) Define age specific death rate and age specific birth rate.

5) Explain what is S.T.D.R. and also explain the methods of obtaining S.T.D.R.

6) (a) Explain why C.D.R. is not suitable for comparing the mortality situations of two populations.

   (b) Define C.D.R. and state its merits and demerits as a measure of mortality.

7) Define G.R.R. and N.R.R.. How are they computed ? Give demographic interpretations of G.R.R. and N.R.R.

8) Distinguish between T.F.R. and G.R.R..

9) State the limitations of G.R.R. and N.R.R.

10) Explain how does G.R.R. and N.R.R. indicate the growth of the population.

11) Interpret the cases

   (i) N.R.R. = 1 (ii) N.R.R. < 1 and (iii) N.R.R. > 1.

C) Questions for 6 marks

1) Compute C.D.R. and S.T.D.R. for the following two towns. Take population of town A as standard population.

Age group	Town A		Town B	
	Population	No. of deaths	Population	No. of deaths
0-5	15000	300	10000	280
5-30	30000	600	25000	400
30 and above	20000	800	15000	750

2) From the following data compute S.T.D.R. for population A and B.

Age group	Town A		Town B		Standard
	Population (in '000)	No. of deaths	Population (in '000)	No. of deaths	Population
0-10	5	35	3	33	3000
10-50	10	45	10	100	7000
50 and above	5	90	7	84	6000

3) (a) compute S.T.D.R. by indirect method for the following data

Age group	0-10	10-20	20-60	60-100
Standard Population	300	500	1500	200
Local Population	200	750	1200	350
No. of Deaths in Standard Population	9	3	12	10

The total number of deaths in local population is 35.

(b) Compute S.T.D.R. and Compare the mortality of two states. Take population of State A as standard population

Age group	Town A		Town B	
	Population in Crores	Death rate per 1000 persons	Population in Crores	Death rate per 1000 persons
0-10	0.5	30	0.7	40
10-20	2.0	5	2.3	4
20-60	1.5	8	1.8	10
60 and above	1.0	50	0.9	30

4) Compute age S.D.R. and hence S.T.D.R. for the local population from the data given below:

Age group	Town A		Standard
	Population	Deaths	Population
0-5	30000	10%	50000
5-15	35000	2.5%	60000
15-40	65000	1%	160000
40 and above	20000	3%	30000

5) Compute the mortality situation of the year 1971 and 1981 of certain city. Take population in 1971 as standard population.

Age group	1981		1971	
	Population	Deaths	Population	Deaths
0-5	20000	400	25000	650
5-15	50000	300	40000	380
15-35	65000	780	60000	720
35 and above	20000	500	15000	625

6) Compute S.T.D.R. by indirect method for the following population.

Age Group	0-10	10-20	20-60	60 and above

Population A: age S.D.R. of standard	400	1500	2400	700
Population standard	40	4	2.4	30
Population	600	1000	3000	400
Total Number of deaths in population A is 67				

7) Compute C.B.R. given that the total number of live births is 7200 and the total population is 2,00,000.

8) Compute C.B.R. for the given population if the data given below

Age Group	0-10	10-25	25-60	60 and above
Population	4000	12000	6000	8000

9) Calculate (i) G.F.R.   (ii) Age S.F.R.   (iii) T.F.R. for the data given below

Age Group	Number of women (in thousands)	Number of births
15-20	8	56
20-25	10	100
25-30	12	84
30-35	6	36
35-40	3	15
40-45	5	5
45-50	4	4

10) Calculate T.F.R. for the following data

Age Group	15-19	20-24	28-29	30-34	35-39	40-44
Female population (in thousand)	16	26	21	18	11	11
Age – S.F.R.	60	285	322	260	125	10

11) Compute T.F.R. given the following

Age Group	15-20	20-25	25-30	30-35	35-440	40-45	45-50
Number of women	1000	1000	1000	1000	1000	1000	1000
Number of births	15	137	116	86	62	19	10

12) The number of births occurring in one of the Indian states in 1980 is as shown below, classified according to age of mother, together with the female population in each group of the child bearing period.

Age Group	Female population	Number of births
15-20	718759	18106
20-25	615779	121503
25-30	532413	143198
30-35	515192	84167
35-40	498576	43125
40-45	477126	18872
45-50	451715	9132

Calculate T.F.R.

13) The following data give the number of women of child bearing ages and yearly births by quinquennial age groups for a city. Calculate G.F.R. and T.F.R.

Age Group	15-20	20-25	25-30	30-35	35-440	40-45	45-50
Female population (in thousand)	19	17	15	14	12	8	5
Number of births	305	1522	2098	1397	805	289	17

14) Find G.F.R. and T.F.R. for the following data

Age Group	15-25	25-35	35-45	45-55
Number of females	2400	2000	1500	500
Number of births	80	120	75	1

15) Compare rates of town A and B taking town A to be standard population and using the following data.

Age group (in years)	Town A		Town B	
	Population	No. of deaths	Population	No. of deaths
Below 10	30000	720	80000	2000
10-40	40000	800	104000	2080
Above 40	20000	560	16000	1080

16) Calculate T.F.R. for the following population distribution.

Age group	Female Population	Number of births
15-25	1000	15
25-35	2000	200
35-45	1000	100
45-55	500	40

17) The table given below gives the number of women in child bearing age and number of

births by quinquennial age groups and survival rates. If the ratio of male births to female births is 13 : 12, calculate G.F.R., T.F.R., G.R.R. ad N.R.R.

Age group	Female Population(in 1000)	No. of births	Survival rate
15-19	16	400	0.95
20-24	15	1710	0.94
25-29	14	2100	0.92
30-34	13	1391	0.90
35-39	12	960	0.88
40-44	11	330	0.87
45-49	9	36	0.85

18) Given the following table calculate G.R.R. and N.R.R.

Age group	Female Population(in 1000)	No. of births	Survival rate
15-19	18	540	0.95
20-24	15	600	0.94
25-29	14	700	0.93
30-34	14	560	0.92
35-39	16	480	0.91
40-44	13	442	0.90
45-49	12	300	0.88

19) From the following data, compute G.R.R. and N.R.R.

Age group	Fertility rate per 1000 women	Percent survival
16-20	10.0	85
21-25	73.0	80
26-30	60.0	70
31-35	37.6	65
36-40	23.0	60
41-45	8.4	50
46-50	1.0	45

20) From the data given below, calculate G.R.R. and N.R.R. given the sex ratio, number of males to number of females is 52 : 48.

Age group	A.S.F.R.	Mortality rate per 1000
16-20	15	120
21-25	150	180
26-30	200	150

31-35	80	200
36-40	50	220
41-45	20	230
46-50	10	250

UNIT 4: Life Table

A) Questions for 4 / 6 marks

1) The complete expectation of life at the ages 40 and 41 years for a particulars group are 20.9 and 20.5 respectively. The number of deaths at the age of 40 years is 1200. Find the number of persons who attain (i) age 40 years and (ii) age 41 years.

2) For the given data write the entries in the columns of d_x, q_x, p_x, L_x of the life table where notations have their usual meaning

Age x	0	1	2	3	4	5
l_x	100	90	80	60	30	0

3) Construct life table for rabbits from the following data:

x	0	1	2	3	4	5	6
l_x	10	9	7	5	2	1	0

4) Determine l_{80}, l_{81}, l_{82}, e^0_{80} given that $l_{79} = 13980$, $d_{79} = 2020$, $d_{80} = 15$, $p_{81} = 0.80$, $T_{80} = 299000$. Notations have usual meaning in the life table.

5) For the given following data, write the entries in the columns d_x, q_x, p_x and L_x of the life table where notations have their usual meaning.

x	60	61	62	63	64	65
l_x	2000	1500	1000	540	120	0

6) Construct the life table for the following data:

x	0	1	2	3	4	5
l_x	30	26	18	10	4	0

7) For the given data write the entries in the column of d_x, q_x, p_x and L_x of the life table, where notations have their usual meaning.

x	0	1	2	3	4	5
l_x	4000	3000	1000	200	40	0

8) For the following table find the terms marked by?

x	l_x	d_x	q_x	p_x	L_x	T_x	e^0_{80}
5	90	?		?	?	290	
6	80					?	?

9) Find the expectation of life at the age of 83 and 84 from the following data:

x	l_x	d_x	q_x	L_x	T_x	e_{80}^0
83	3550	-	0.16	-	-	-
84	-	-	0.17	-	11.975	-

10) Answer the following

   i) If $l_{22} = 70368$, $l_{21} = 70768$, $T_{22} = 2394139$, find e_{21}^0

   ii) If $q_{50} = 0.0325$, $l_{50} = 24250$, find L_{50}

   iii) If $l_{16} = 73490$, $l_{17} = 73120$, find q_{16}

11) In usual notations if $l_{50} = 52800$, $l_{55} = 49200$, $l_{60} = 36600$, find the probability that (i) a person of age 50 will live for 10 years (ii) a person of age 50 will die within 5 years.

12) Determine l_1, l_2, l_3 given that $l_0 = 100$, $q_0 = 0.10$, $q_1 = \frac{1}{9}$, $p_2 = \frac{15}{16}$

13) You are given an extract from a life table as shown below

Age x	d_x	e_x^0
1	10	3.22
2	-	2.56

   calculate the number of persons living at ages 1 and 2

14) In a complete life $l_{92} = 59$ and $L_{92} = 46$. Find the value of p_{92}.

15) Given: $l_4 = 756$, $l_5 = 453$ and $T_4 = 968$. Find the values L_4, T_5 and e_4^0.

16) Find the values of l_{81}, l_{82} and l_{83}, given that $l_{80} = 717$, $d_{80} = 214$, $q_{81} = 0.3364$, $p_{82} = 0.62006$

17) Find the values of l_3, l_4 given that $l_2 = 945$, $d_2 = 189$ and $q_3 = 0.4$

18) Explain the construction of life table.

19) State uses of life table.

20) Define expectation of life.

21) Compute T_{20} Given that $e_{20}^0 = 31\, and\, l_{20} = 550$.

22) Given the number of dogs at age x complete the life table for dogs.

x	5	6	7	8	9	10
l_x	1000	940	780	590	25	0

23) Fill in the blacks of the following life table which are shown with the question marks

Age	l_x	d_x	q_x	p_x	L_x	T_x	e_x^0
4	880	?	?	?	?	?	?
5	648					11124	

24) Compute e_0^0, e_1^0, e_2^0 for

x	0	1	2
l_x	550	300	87
T_x	?	?	896