ANEKANT EDUCATION SOCIETY'S

TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE AND COMMERCE, BARAMATI

AUTONOMOUS

QUESTION BANK

FOR

F.Y.B.Sc(Computer Science)

STATISTICS

CSST- 1201: STATISTICAL METHODS – II

(With effect from June 2019)

Unit No. 1: Regression

Questions for 1 mark

A) Multiple Choice Questions

1. The two regression lines intersects at
   a) (0,0) b) (1,1) c) (X,Y) d) $(\overline{X}, \overline{Y})$
2. If the two regression lines are Coincident then
   a) bxy=byx b) bxy=1/ bxy c) bxy= -byx d) byx=0
3. The regression coefficient byx is given by
   a) $r\frac{\sigma_x}{\sigma_y}$ b) $\frac{\sigma_x}{\sigma_y}$ c) $r\frac{\sigma_Y}{\sigma_X}$ d) 0
4. The regression coefficient have
   a) the same algebraic signs b) the opposites algebraic signs
   c) always positive sign d) always negative sign
5. The regression coefficients are always
   a) reciprocal of each other b) equal numerically
   c) Opposite in algebraic signs d) are parallel
6. If X is measured in cm and Y is measured in kg then the units of
   a) byx is cm/kg b) byx is kg/cm c) byx is kg/cm^2 d) byx is unitless
7. If byx=bxy then
   a) r = 1 b) r = -1 c) r = 0 d) $\sigma_x = \sigma_y$
8. If U=2X and V=3Y then
   a) buv= 6bxy b) buv=$\frac{2}{3}$ bxy c) buv=$\frac{3}{2}$ bxy d) bvu=$\frac{1}{6}$ bxy
9. If the correlation coefficient $r = \pm 1$ then the regression lines
   a) are parallel b) are coincident
   c) are perpendicular to each other d) do not exist.
10. If the Corr(X,Y) = 0 then the regression lines will be
    a) parallel to each other b) perpendicular to each other

Questions for 2 marks

1. Define the following terms:
   - line of regression
   - regression coefficient
2. Given $b_{yx} = -1.4$ & $b_{xy} = -0.5$, calculate r_{xy}.

3. State any two properties of regression coefficient.
4. Given $b_{yx} = -1.4$ & $b_{xy} = -0.5$, calculate r_{xy}.
5. Comment on the following. For a bivariate distribution, $b_{yx} = 4.2$ & $b_{xy} = 0.5$.
6. For a bi-variate distribution byx = 2.8 and $b_{xy} = -0.3$ Comment.
7. With $b_{xy} = 0.5$, r = 0.8 and variance of y = 16, find σx .
8. If $b_{yx} = 0.8$ & $r_{xy} = 0.69$, what would be the value of b_{xy} ?
9. Given the two regression lines Y=4X and Y-X = 6 ,find $\overline{X}$, $\overline{Y}$.
10. Given $\sigma_x = 1$, $\sigma_y = 2$, r=0.7 find Cov(X,Y).

Questions for 4 marks

1. What do you mean by regression? Why are there two regression lines in case of a bi-variate series ?
2. What is regression ? State any two properties of regression coefficients.
3. Explain the least square principle of obtaining regression lines.
4. Define coefficient of determination & state its utility.
5. A student obtained the two regression lines as:

   $2x - 5y - 7 = 0$ & $3x + 2y - 8 = 0$ Do you agree with him?

6. The lines of regression of a bivariate population :-

   $8x - 10y + 66 = 0$
   $40x - 18y = 214$

   Find i) the mean values of x & y ii) correlation coefficient between x & y. Also find σ_y given that $\sigma_x = 3$

Questions for 6 marks

1. The correlation coefficient between x & y is r = 0.60 If $\sigma_x = 1.50$ $\sigma_y = 2.00$, $\bar{x} = 10$ & y = 20, find the equations of regression lines i) y on x & ii) x on y .
2. Derive the expression for regression line of y on x .
3. Derive the expression for regression line of x on y
4. From the following data:

   n=5, $\sum X = 30$, $\sum Y = 40$, $\sum X2 = 220$, $\sum Y2 = 340$, $\sum XY = 214$

   i) Find regression equation of X on Y.

ii) Find regression equation of Y on X.

5. The lines of regression of y on x and x on y are $y = 0.3x + 10.0$ and $x = 1.2y + 0.8$ respectively. Determine the means of x & y the ratio of the standard deviation of x & y, the correlation coefficient between x & y.

6. Given the following information :

   Mean height($\overline{X}$) = 120.5cm , Mean age ($\overline{Y}$) = 10.37 years

   S.D(X) = 12.7cm , S.D(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 12 years.

7. For a bivariate data we have $\overline{X} = 53$, $\overline{Y} = 28$, byx= -1.5, bxy= -0.2 find

   i) Correlation coefficient between X and Y.

   ii) estimate of y on x =60.

   iii) estimate x on y =30.

8. In the regression analysis the equation of two lines of regression are $2X + 3Y = 8$ and $2Y + X = 5$ and the variance of X = 4.

   Find :

   (1) Mean values of X and Y.

   (2) Coefficient of correlation between X and Y.

   (3) The standard deviation of Y.

Unit 2: Multiple Regression, Multiple and Partial Correlation

Questions for 1marks

A) Multiple Choice Questions

1. The multiple correlation coefficient lies in between

   a) -1 to 1 b) 0 to 1 c) -1 to 0 d) 0 to ∞

2. The partial correlation coefficient lies in between

   a) -1 to 1 b) 0 to 1 c) -1 to 0 d) 0 to ∞

3. Limits of multiple correlation coefficient R1.23 are is________

   a) -1 to 1 b) 0 to 1 c) -1 to 0 d) 0 to ∞

4. Multiple correlation coefficient $R_{1.23}{}^2$ is given by ________

   a) $\frac{r_{12}^2+r_{13}^2-2r_{12}r_{13}r_{23}}{1-r_{23}^2}$ b) $\frac{1+r_{12}^2+r_{13}^2-2r_{12}r_{13}r_{23}}{1-r_{23}^2}$

   c) $\frac{r_{12}^2+r_{13}^2-r_{12}r_{13}r_{23}}{1-r_{23}^2}$ d) $\frac{r_{12}^2+r_{13}^2+r_{23}^2-2r_{12}r_{13}r_{23}}{1-r_{23}^2}$

5. The partial correlation coefficient $r_{12.3}$ is given by ________

   a) $\frac{r_{12}^2+r_{13}^2}{1-r_{23}^2}$ b) $\frac{r_{12}-r_{13}r_{23}}{\sqrt{(1-r_{13}^2)(1-r_{23}^2)}}$ c) $\sqrt{\frac{r_{12}-r_{13}r_{23}}{(1-r_{13}^2)(1-r_{23}^2)}}$ d) $\frac{r_{12}-r_{13}r_{23}}{\sqrt{1-r_{11}^2}}$

6. The regression planes coincide if _______

   a) $|R|=0$ b) $|R|=1$ c) $|R|<1$ d) $|R|>1$

7. The multiple correlation coefficient is invariant under the change of _______

   a) origin b) scale c) origin and scale d) neither origin nor scale

8. The partial correlation coefficient is invariant under the change of

   a) origin b) scale c) origin and scale d) neither origin nor scale

9. If $R_{1.23}$ is a multiple correlation coefficient then :

   a) $r_{12} \geq R_{1.23}$ b) $r_{12} \leq R_{1.23}$

   c) $\max\{|R_{12}|,|R_{13}|\} \leq R_{1.23}$ d) $r_{12} < R_{1.23}$

10. The Corr $(X_{1.3}, X_{2.3})$ is

    a) r_{12} b) r_{13} c) $r_{12.3}$ d) $r_{13.2}$

11. The coefficient of multiple determination is

    a) $R_{1.23}$ b) $R_{2.13}$ c) |R| d) $R_{3.12}$

12. A measure of extent of linear relationship between X_1 with the other variables X_2 and X_3 is given by ,

    a) simple correlation b) partial correlation c) multiple correlation d) simple regression

13. In a trivariate study the correlation coefficient between any two variables when third variable held constant is called as ________

    a) simple correlation b) partial correlation c) multiple correlation d) multiple regression

Questions for 2 marks

1. Define multiple correlation.
2. Define partial correlation.
3. State the equation of multiple regression plane of X1 on X2 and X3.
4. State the equation of multiple regression plane of X2 on X1 and X3.
5. State the equation of multiple regression plane of X3 on X1 and X2.
6. State relation for $R_{2.13}$ in terms of total correlation coefficients.
7. State relation for $r_{13.2}$ in terms of total correlation coefficients.
8. State the limits within which multiple correlation coefficient lies.
9. If $r_{12}=r_{13}=0$ then show that $R_{1.23} = 0$.

Questions for 4 marks.

1. Explain the concept of multiple regression with an illustration.
2. Explain the concept of partial correlation coefficient in a trivariate data. State the expression for the partial correlation coefficient r12.3 in terms of total correlation coefficients
3. Explain the concept of multiple regression using Yule's notation. Explain in brief, the method of fitting of equation of regression plane of X1 on X2 and X3
4. Define partial regression coefficients $b_{12.3}$ and $b_{13.2}$ in the plane of regression of X1 on X2 and X3.
5. Obtain the least square regression equation of X1 on X2 and X3.
6. Explain concept of partial correlation in a trivariate data with help of an example.

7. If r_{12} =0.6, r_{13} =0.7 , r_{23} = 0.65 .
   Compute i) $R_{1.23}$ ii) $R_{3.12}$
8. Examine whether the results r_{12} =0.6, r_{13} =0.7 , r_{23} = -0.5 are consistent?
9. Find $R_{1.23}$ if r_{12} = 0.6 , $r_{13.2}$ =0.4
10. Show that $R_{1.23}$ = 0 does not imply $R_{2.13}$ = 0 or $R_{13.2}$ = 0
11. If $R_{1.23}$ = 1 then show that $R_{2.13}$ = 1 = $R_{3.12}$
12. If r_{12} = 0.6 , r_{13} =0 then find $R_{1.23}$

Questions for 6 marks

1. If all the total correlation coefficients in a set of three variables are equal to $k (k \neq 1)$ then show that

   i) $R^2_{1.23} = \frac{2k^2}{1+k}$ ii) $r_{12.3} = \frac{k}{1+k}$

2. Given the data r_{12} =0.6, r_{13} =0.4, find the value of r_{23} so that $R_{1.23}$ should be unity.
3. For a trivariate data, σ_1= 4, σ_2= 8, σ_3 = 7, r_{12} = 0.45,r_{13} = 0.55, r_{23}= 0.65. Find the values of $b_{12.3}$ and $r_{23.1}$.

Questions for 8 marks

1. Let X1, X2, X3 be the heights (in cms) of son, mother and father respectively. A sample on X1, X2 and X3 gave following results,

   $\overline{X_1}$ =168 , $\overline{X_2}$ =150 , $\overline{X_3}$ =170

   σ_1 = 2.4 , σ_2 = 2.7, σ_3 = 2.7

   r_{12} =0.28, r_{13}=0.42, r_{23} =0.51

   i) Obtain the equation of least square regression plane of X_1 on X_2 and X_3.

   ii) Estimate the height of son when height of mother is 155 cm and height of father is 160 cm.

2. Given that :

   σ_1 = 2.4 , σ_2 = 2.7, σ_3 = 2.7

r_{12} =0.28, r_{13}=0.42, r_{23} =0.51

i) Obtain the equation of least square regression plane of X_1 on X_2 and X_3.

3. In a trivariate distribution on :

X1 : Marks in Mathematics,
X2 : Marks in Physics
X3 : Marks in Statistics.

$\overline{X_1}$ =68 , $\overline{X_2}$ =70 , $\overline{X_3}$ =74

σ_1^2 = 100 , σ_2^2 = 25, σ_3^2 = 81

r12 = 0.6, r13 = 0.7 , r23 = 0.6.

Determine the regression equation of X_3 on X_1 and X_2, if the variables are measured from their respective marks.

4. For the following data:

S.D (X_1) =10 r_{12} = 0.6

S.D (X_2) = 5 r_{13} = 0.7

S.D (X_3) = 9 r_{23} = 0.65

Obtain: 1) The equation to the plane of regression for X_3 on X_1 & X_2.

2) Estimate value of X_3 for X_1 = 7 & X_2 = 8.

5. In a trivariate distribution on :

X1 : height in centimeter of mother ,
X2 : height in centimeter of son
X3 : height in centimeter of father

$\overline{X_1}$ =165 , $\overline{X_2}$ =159 , $\overline{X_3}$ =155

σ_1^2 = 100 , σ_2^2 = 25, σ_3^2 = 81

r12 = 0.6, r13 = 0.7 , r23 = 0.6.

Determine the regression equation of X_2 on X_1 and X_3.

6. For the following data:

$$S.D\ (X_1) = 25 \qquad r_{12} = 0.9$$

$$S.D\ (X_2) = 81 \qquad r_{13} = 0.6$$

$$S.D\ (X_3) = 64 \qquad r_{23} = 0.60$$

Obtain: 1) The equation to the plane of regression for X_2 on X_1 & X_3.

2) Estimate value of X_2 for $X_1 = 5$ & $X_3 = 3$.

Unit 3: Time Series

Questions for 1 marks

Multiple Choice Questions

1. Secular trend in time series is a nature of
   a) increasing b) decreasing c) stagnant d) non increasing
2. In Time series, the component having period of oscillation less than one year is called
   a) trend b) seasonal variation c) cyclical variation d) irregular variation.
3. Linear trend means
   a) no change b) constant change c) change are in geometric progression d)none of the above
4. Moving average remove the cyclical variation if the ________

   a) Period is even b) Period is odd

   c)average is weighted d) period is same as that of cycle.
5. Moving average method is not suitable for

   a) removing rhythmic variation

   b) projections

   c) estimating seasonal variation

   d) none of the above.
6. Moving average method suffers from the drawback

   a) It is subjective method

   b) it does not estimate trend for all the time points

   c) both a) and b) is true

   d) neither a) and b) nor time
7. Least square method

   a) reduces the calculations

   b) does not give estimate for future

   c) reduces the sum of squares of errors

   d) in subjective.

Questions for 2 marks

1. What is meant by time series.
2. Mention components of time series with illustrations.
3. Define additive and multiplicative models.
4. State various methods used to find the trend in time series.

Questions for 4 marks.

1. What is Time Series ? Give one illustration
2. Discuss a time series. What are the components of time series.
3. Explain the concept of trend in a time series. Also state multiplicative and additive model of a time series.
4. Explain trend, seasonal variation and cyclical variation by giving illustration
5. Calculate 3-yearly moving averages for the following data :

Year	Inventory (in tones)
1998	78
1999	73
2000	71
2001	73
2002	75
2003	78
2004	73

6. What is 'Secular Trend'? Explain any one method of measuring the trend of a time series.
7. Name the different components of time series with illustration.
8. Define time series discuss the four components of time series illustrate with the examples.
9. Distinguish between seasonal variation and cyclical variation.
10. State merits and demerits of method of moving averages.
11. State merits and demerits of method of least squares.

Questions for 6 marks

1. What is time series ? Discuss any three components of time series. Give one example for each.

2. Estimate trend value using method of moving averages with m = 4 for the following data on the number of students studying in a college during years 2001 to 2010 :

Year	Number of Students
2001	3320
2002	3170
2003	3570
2004	3920
2005	4020

2006	4050
2007	4100
2008	4270
2009	4050
2010	4380

Unit 4: Continuous Random Variable

Questions for 1marks

A) Multiple Choice Questions

1. If the probability density function (p.d.f.) of a variable Y is

   $f(y) = ky(2-y)$;$0 \le y \le 2$ then the value of k is

   a) 2/3 b) 3/2

   c) 4/3 d) 3/4

2. If X is a continuous random variable then $P(a \le X \le b)$ is

   a) F(a) - F(b) b) F(b) - F(a)

   c) 1- F(a) + F(b) d) f(a) - f(b)

3. If F(x) is a distribution function and $x_2 > x_1$ then

   a) $F(x_2) < F(x_1)$ b) $F(x_2) \le F(x_1)$

   c) $F(x_2) \ge F(x_1)$ d) $F(x_2) > F(x_1)$

4. Which of the following is not a continuous random variable?

   a) weight of an individual b) altitude of a certain place

   c) time required to complete the task d) size of a family

5. If X has p.d.f. $f(x)=\begin{cases} kx^3 & ;0\le x\le 1 \\ 0 & ;otherwise \end{cases}$ then value of k is

   a) 3 b) 4

   c) 2 d) 1

6. If X has p.d.f. $f(x)=\begin{cases} cx^2 & ;-1\le x\le 1 \\ 0 & ;otherwise \end{cases}$ then value E(X) is

   a) 0 b) 3/2

   c) 2/3 d) 4/3

7. If X is a random variable with p.d.f. $f(x) = \frac{1}{2}e^{-|x|}$; -∞ < x < ∞

a) 2 b) ln 2

c) 0 d) –ln 2

8. If X has p.d.f. $f(x) = \frac{k}{1+x^2}$; -∞ < x < ∞, then the value of k is

a) 1 b) Π

c) 1/ Π d) Π/2

Questions for 2 marks.

1. Define the following :
   a) Continuous random variable
   b) Continuous Probability Distribution
   c) Distribution Function
2. State any two properties of distribution function.
3. A continuous random variable X has the probability density function:

$$f(x) = \begin{cases} cx(2-x) & ; 0 \le x \le 2 \\ 0 & ; otherwise \end{cases}$$

   Find the value of c.

4. Verify whether the following function can be considered as a valid probability density function.

$$f(x) = \begin{cases} \frac{2(x+2)}{5} & ; 0 \le x \le 1 \\ 0 & ; otherwise \end{cases}$$

5. Verify whether the following function can be considered as a valid probability density function.

$$f(x) = \begin{cases} 6x(1-x) & ; 0 \le x \le 1 \\ 0 & ; otherwise \end{cases}$$

6. If x is a continuous random variable with p.d.f.

$$f(x) = \begin{cases} kx & ; 0 \le x \le \\ 0 & ; otherwise \end{cases}$$

   Find value of k.

7. The distribution function of a random variable X is given by,

$$F(x) = \begin{cases} 0 & ; if \ \ x < 0 \\ 2x^2 & ; if \ \ 0 \le x \le \frac{1}{2} \\ 4x - 2x^2 - 1 & ; if \ \ \frac{1}{2} \le x \le 1 \\ 1 & ; if \ \ x > 1 \end{cases}$$

Find the p.d.f. o f X.

8. If x is a continuous random variable with p.d.f.

$$f(x) = \begin{cases} kx^3 & ; 0 \le x \le \\ 0 & ; otherwise \end{cases}$$

Find value of k.

9. If X → U[a, 10] and P(3 < X < 7) = 1/2, find the value of a.

10. A continuous random variable X has the probability density function (p.d.f.)

$$f(x) = \begin{cases} k & ; 2 \le x \le 5 \\ 0 & ; otherwise \end{cases}$$

Find the value of k.

11. The demand for a certain commodity is a random variable specified by the probability density function

$$f(x) = \begin{cases} kx & ; if \ 0 < x < 10 \\ k(20 - x) & ; if \ 10 < x < 20 \\ 0 & ; otherwise \end{cases}$$

Find k, mean Standard Deviation of demand.

Questions for 4 marks.

1. A projectile is fired at a target. The distance from the point of impact to the center of the target (in meters) is a random variable (X) with probability density function (p.d.f.),

$$f(x) = \begin{cases} 6x(1 - x) & ; 0 \le x \le 1 \\ 0 & ; otherwise \end{cases}$$

Find:

a) P(X < 0.4)
b) Distribution Function of X

2. Define Distribution function of a continuous random variable. State any two properties of the distribution function.
3. Suppose that X is a continuous random variable whose p.d.f. is given by

$$f(x)=\begin{cases} c(4x-2x^2) & ;0<x<2 \\ 0 & ;otherwise \end{cases}$$

Find the value of c and $P(X \geq 1)$
4. Find distribution function of a random variable with the following p.d.f.

$$f(x)=\begin{cases} k(3x^2+4) & ;0\leq x\leq 2 \\ 0 & ;otherwise \end{cases}$$

Questions for 6 marks.

1. If a random variable X has the density function,

$$f(x)=\begin{cases} \frac{1}{4} & ;-2\leq x\leq 2 \\ 0 & ;otherwise \end{cases}$$

Find :
   a) P(X < 1)
   b) P[|X| > 1]
   c) P[2X +3 > 5]
2. Verify which of the following functions are probability density function(p.d.f.):
   a) $f(x)=\begin{cases} 4x^3 & ;0\leq x\leq 1 \\ 0 & ;otherwise \end{cases}$
   b) $f(x)=\begin{cases} 2e^{-x} & ;x\geq 0 \\ 0 & ;otherwise \end{cases}$
   c) $f(x)=\begin{cases} 2x & ;0<x<1 \\ 4-2x & ;1<x<2 \\ 0 & ;otherwise \end{cases}$

Unit 5: Some Continuous Probability Distributions

Questions for 1 marks.

A) Multiple Choice Questions

1. If X is a random variable following uniform distribution over [a,b] then mean of the distribution is

   a) $\frac{b-a}{2}$

   b) $\frac{a-b}{2}$

   c) $\frac{ab}{2}$

   d) $\frac{a+b}{2}$

2. If X→U[3,8] then the distribution function at 5 i.e. F(5) is

   a) $\frac{5}{11}$

   b) $\frac{3}{5}$

   c) $\frac{2}{5}$

   d) $\frac{3}{11}$

3. If X→U[4,16] then var(x) is

   a) 20　　b) 12

   c) 10　　d) 8

4. Suppose X→U[-a , a] such that P[|X| > 1] = $\frac{6}{7}$ then value of a is

   a) 7　　b) 6

   c) 14　　d) 12

5. If X→U[a , b] with mean 3 and variance 3 respectively then

   a) a = 8,b = 2　　b) a = 10,b = 6

   c) a =2,b = 8　　d) a = 10,b = 3

6. If X follows exponential distribution then

a) Mean – variance
b) Mean = Standard deviation
c) Mean > Standard deviation
d) Mean = Mode

7. If $X \rightarrow N[100,9]$ then $P[|X|>103] =$

a) 0.31732
b) 0.15866
c) 0.68268
d) 0.84134

8. If $X \rightarrow N[100,16]$ then the mean and variance of X+3 are

a) 100,16
b) 103,19
c) 103,16
d) 100,19

9. If X and Y are independent N(10,9) and N(15,16) , then X+Y follows

a) N(25,25)
b) N(12.5,337)
c) N(5,25)
d) N(0,1)

10. If $X \rightarrow N[5,9]$ and $Y \rightarrow N[0,1]$ then

a) $Y = \frac{X+5}{3}$

b) $Y = \frac{X+5}{9}$

c) $Y = \frac{X-5}{9}$

d) $Y = \frac{X-5}{3}$

11. If $X \rightarrow N[0,1]$ then $P[-1.96 \le X \le 1.96]$ is about

a) 0.99
b) 0.01
c) 0.95
d) 0.05

12. The percentage observations from $N(\mu,\sigma^2)$ in the interval $(\mu - 2.58\sigma , \mu + 2.58\sigma)$ is

a) 99
b) 95
c) 90
d) 5

Questions for 2 marks.

1. Define continuous random variable.
2. Define Expectation of a continuous random variable.
3. Define Variance of a continuous random variable.
4. Define Probability density function (p.d.f.) of a continuous random variable.
5. State the theorem on normal approximation to binomial distribution.
6. State the theorem on normal approximation to Poisson distribution.
7. State the additive property of two independent normal variates.
8. Find mean and variance of a random variable X following uniform distribution over an interval [a,b]
9. If X → N(10, 36), Y → N(20, 49) and if X and Y be independent, then state the distribution of (X + Y).
10. If X → N(10, 36), Y → N(20, 49) and if X and Y be independent, then state the distribution of (X - Y).
11. Let X follows N(1,4) and Y follows N(2,4). If X and Y are independent then state the distribution of (X+Y)
12. Verify whether the following function can be considered as a valid probability density function :

$$f(x)=\begin{cases}\dfrac{2(x+2)}{5} & ;\ 0\le x\le 1\\ 0 & ;\ otherwise\end{cases}$$

13. State lack of memory property of an exponential distribution.
14. If mean and variance of U[a, b] distribution are 5 and 3 respectively, determine the values of a and b.
15. Let X have normal distribution with mean 5 and variance 16, If Y= 3X +7, find P[Y>24].

Questions for 4 marks.

1. State and prove lack of memory property of exponential distribution with mean θ
2. Define an exponential distribution with mean θ. Find its distribution function.
3. Define normal distribution. State central limit theorem of normal distribution.
4. If a continuous random variable X follows uniform distribution in the range (2, 7), find the probability that X takes value between 2.5 and 4. Also find P(X < 3.4) and P(X = 3).
5. State p.d.f. of normal distribution with mean μ and variance o2.
6. Let X follows normal distribution with mean 3 and variance 25. If Y = (2X + 4), find P(Y < 8).
7. If X has uniform distribution in range (–a, a), a > 0, find the value of 'a' such that P(|X| < 1) = P(|X| > 1).
8. If X → N(1, 9) and Y → N(2, 16) are independent random variables, calculate :

   a) P(5 < X < 7)
   b) P(X + Y > 5).

9. Explain the method of drawing a model sample from a uniform (a, b) distribution.
10. The failure time of a component X is assumed to have an exponential distribution with mean of 100 hours. Find the probability that any particular component will :
    a) last at least for 200 hours and
    b) last between 250 and 300 hours.
11. If $X \rightarrow N(5, 16)$, find :
    a) $P(5 \leq X \leq 7)$
    b) $P(3X + 7 > 24)$.
12. If $X \rightarrow N(1, 9)$ and $Y \rightarrow N(2, 16)$ are independent random variables, calculate :
    a) $P(5 \leq X \leq 7)$
    b) $P(X + Y \geq 5)$.

Questions for 6 marks.

1. Given a random variable X having normal distribution with $\mu = 16.2$, $\sigma^2 = 1.5625$. Find the probabilities that it will take a value
    a) greater than 16.8
    b) less than 14.9
    c) between 16.5 and 18.8
2. A group of 400 children is given an Intelligence Test. The average I.Q. of the group is found to be 105 with standard deviation 16. What proportion of the group will have I.Q. above 135? How many will have I.Q. below 85?
3. Let X have a normal distribution with mean 17 and variance 9 . Find:
    a) $P[X>18]$
    b) $P[14 < X < 19]$
    c) $P[X> 20 \text{ or } X < 13.5]$
4. A grinding machine is set so that its production of shafts has an average of diameter of 10.10 cms and standard deviation of 0.20 cms. What proportion of output meets the specifications presuming normal distribution?
5. The time between two arrivals in a quering model is normally distributed with a mean 3 minutes and standard deviation of 0.45 minutes. If a random sample of size 25 is drawn, what is the probability that the sample average is greater than 3.14 minutes?

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