# MCQs MTH302 for practice

## Unit 1

Q.1 Let $X$ be a random variable with $E[X]=2$ and $E[X(X-1)]=8$ then variance of $X$

(a) 5 (b) 4 (c) 9 (d) 6

Ans: (d)

Q.2 If $X$ is a random variable, then $Var(3X+7)$ is equal to

(a) $3Var(X)$ (b) $3Var(X)+7$ (c) $3Var(X)+Var(7)$ (d) $9\,Var(X)$

Ans: (d)

Q.3 If $Var(X)=3$, then $Var(2X+3)$ is

(a)-21 (b) 23 (c)12 (d) -12

Ans: (c)

4.The probability density function of a random variable $(X,Y)$ is given by $f(x,y)=2, 0\le x\le y\le 1.$ The marginal distribution of $Y$ is given by

(a) $2y, 0\le y\le 1$ (b) $2x, 0\le x\le 1$

(c) $2y, 0\le x\le y$ (d) $2(1-x), 0\le x\le 1$

5.Let $(X,Y)$ be a random variable with $f(x,y)=8xy, 0<y<x<1$, $g(x)=4x^3, 0<x<1$ and $h(y)=4y(1-y^2), 0<y<1$. The conditional distribution of $X$ given $Y$ is

(a) $\frac{2x}{1-y^2}, 0<x<y<1$ (b) $\frac{2x}{1-y^2}, 0<y<x<1$

(c) $\frac{2y}{x^2}, 0<y<x<1$ (d) $\frac{2y}{x^2}, 0<x<y<1.$

6. Let $X$ be random variable with distribution function

$$F(x)=\begin{cases}0, & x<0\\ x^2, & 0\le x<1\\ 1, & x\ge 1\end{cases}$$

Then $P(0\le 3X-1\le 1)=$

(A) 3/5 (B) 2/7 (C) 1/3 (D) 1

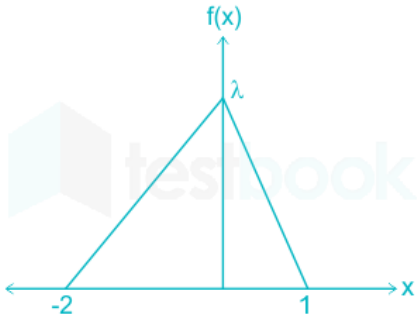
Q7. If the p.d.f of RV $X$ given as $f(x)=\begin{cases}kx^2-3, & 0\le x\le 3\\ 0, & otherwise\end{cases}$, then value of $k$ is

(A) $-1$ (B) 10/9 (C) 5/8 (D) 9/7

Q8. $f(x)=\begin{cases}\frac{1}{\beta-\alpha}, & \alpha\le x\le\beta\\ 0, & otherwise\end{cases}$, if $\alpha=-1,\beta=2$, then $P\left(|X|\le\frac{1}{2}\right)=$

(A) 1/3 (B) 1/2 (C) 5/6 (D) 2/3

Q9. Graph of $f(x)$ is shown below. For what value of $\lambda$, $f(x)$ can be used as pdf.




(A) 2/3 (B) 3/4 (C) 4/5 (D) ½

Q10. If pdf of random variable $X$ is given as $f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0, & otherwise \end{cases}$, then value of distribution function $F(x)$ at $x = 1/3$ is

(A) 2/3 (B) 3/8 (C) 1/9 (D) ½

Q11.If X and Y denote the random variables, then which is not random variable?

(A) $\pi(X - Y)$ (B) $X + Y$ (C) $X - Y$ (D) All of the above

Q12.If $p(x) = \begin{cases} \frac{x}{15}, & x = 1, 2, 3, 4, 5 \\ 0, & otherwise \end{cases}$ then $P\left(\frac{1}{2} < X < \frac{5}{2} \middle| X > 1\right)$

(A) 1/7 (B) 2/7 (C) 3/7 (D) 4/7

Q13.Consider the statements:

(i) For a discrete random variable X, the probability at a point is always vanish.

(ii) For a continuous random variable X, the probability at a point is always vanish.

(A) The statement (i) is correct but not (ii). (B) The statement (ii) is correct but not (i).

(C)The statements (i) and (ii) both are correct. (D) Neither the statement (i) nor (ii) is correct.

Q14.Statement: The variance $var(\pi) = \pi$.

Reason: The variance is independent of change of origin.

(A) Statement and reason both are correct. (B) Statement is correct but not the reason.

(C) Reason is correct but not the statement. (D) Neither the statement nor the reason is correct.

Q15.The covariance $Cov\ (\pi, -\pi)$ is

(A) $-\pi^2$ (B) $\pi^2$ (C) $-\pi$ (D) $Cov\ (1, -1)$

Q16.

The random variable X has the following distribution. Then P(X = 10) is:

| X | 1 | 2 | 4 | 10 |
|---|---|---|---|---|
| P(x) | 0.3 | 0.2 | 0.2 | ? |

(a) 0.2 (b) 0.5 (c) 0.3 (d) 0.1

Ans c

Q17.If X is the discrete random variable and its pdf is given by f(x)= (x+2)/25, for X=1,2,3,4,5 , then cdf F(3)=

a)7/25 b) 12/25 c) 13/25 d) none of these

Q18.Find the probability of getting 2 club cards when 2 cards randomly drawn without replacement from well shuffled pack of 52 cards.

(a) 3/51 (b) 3/52 (c) 1/16 (d) None of these

Q19. Find the probability of getting 2 club cards when 2 cards randomly drawn with replacement from well shuffled pack of 52 cards.

(a) 3/51 (b) 3/52 (c) 1/16 (d) None of these

Q20.Find the probability of hitting the target when up to 3 fires are shot from gun whose probability of hitting the target is 0.4.

(a) 0.96 (b) 0.348 (c) 0.384 (d) None of these

Q21.A random variable $X$ has a mean $\mu = 8$, and $Variance\ is\ 9$, of any unknown probability distribution. Then $P(|X - 8| \geq 4) \leq$

(a) cannot be predicted from limited data (b) 9/16

(c) 16/9 (d) None of these

Q22.A random variable $X$ has a mean , $\mu = 12$, and $Variance\ is\ 1$, of any unknown probability distribution. Then $P(9 < X < 15) \geq$

(a) cannot be predicted from limited data (b) 8/9

(c) 1/9 (d) None of these

Q23.

Let $X$ and $Y$ be continuous random variables with the joint probability density function

$$f(x, y) = \begin{cases} cx(1-x), & \text{if } 0 < x < y < 1, \\ 0, & \text{otherwise,} \end{cases}$$

Where $c$ is a positive real constant. Then $E(X)$ equals

(a) $\frac{1}{5}$ (b) $\frac{1}{4}$ (c) $\frac{2}{5}$ (d) $\frac{1}{3}$

**Answer – (c)**

**Q24.**

Let $X$ and $Y$ be continuous random variables with the joint probability density function

$$f(x, y) = \begin{cases} x + y, & \text{if } 0 < x < 1, 0 < y < 1, \\ 0, & \text{otherwise.} \end{cases}$$

Then $P\left(X + Y > \frac{1}{2}\right)$ equals

(a) $\frac{23}{24}$ (b) $\frac{1}{12}$ (c) $\frac{11}{12}$ (d) $\frac{1}{24}$

**Answer – (a)**

## Unit 2

Q1. The correlation coefficient $r(X, Y)$ is 0.6. Find $r(U, V)$, where $U = \frac{X-2}{5}$ and $V = \frac{Y-1}{7}$.

(a) 0.4 (b) 0.66 (c) 0.6 (d) 0.5

Q2. The covariance between $X$ and $Y$ is 0.35, variance of $X$ is 1.1576 and variance of $Y$ is 1.6075. Find the correlation coefficient.

(a) 0.25 (b) 0.35 (c) 0.4 (d) 0.5

Q3. Using the following information on a bivariate data set, regression line of $Y$ on $X$ is

$$\bar{X} = 1, \bar{Y} = 2, s_X = 3, s_Y = 9, r = 0.8$$

(Here $s$ stands for standard deviation)

(A) $Y = 1 + 2.4(X - 1)$ (B) $Y = 2 + 0.27(X - 1)$

(C) $Y = 1 + 0.27(X - 2)$ (D) $Y = 2 + 2.4(X - 1)$

Q. 4. Karl Pearson's Correlation Coefficient is also called

(a) Rank Correlation (b) Product Moment Correlation (c) Both (a) and (b) (d)None of the these

Ans: (b)

Q.5 Correlation Coefficient is independent of change of

(a) Origin but not of scale (b) Scale but not of Origin (c) Origin and Scale (d) None of these

Ans: (c)

Q6. In the regression line $Y = a + bX$, where $\bar{X} = 2.5, \bar{Y} = 5.5$ and $a = 1.50$, then value of $b$ is
(A) 1.75 (B) 1.60 (C) 2 (D) 2.5

Q7. Two regression lines are given as $3X + 2Y = 26, 6X + Y = 31$, then ratio of variances of $X$ to $Y$ is
(A) $\frac{1}{9}$ (B) $\frac{1}{4}$ (C) $\frac{2}{5}$ (D) $\frac{3}{8}$

Q8. Two regression lines are given as $3X + 2Y = 26, 6X + Y = 31$, then correlation coefficient between $X$ and $Y$ is
(A) 2 (B) $-2$ (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

Q9. Angle between the regression lines for two uncorrelated variables is
(A) $0^o$ (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{3}$

Q10.If two lines of regression are x+3y-5=0 and 4x+3y-8=0, then the correlation coefficient between x and y is

(a) 1/3 b) ½ c) – ½ d) -3/5

Q11.If the regression coefficients of regression equation of X on Y is 0.4 and of Y on X is 1.6, then the regression coefficient of U=3X on V=2Y is

a)0.4 b) 1.6 c) 1.066 d) 0.6

Q12. Two regression lines coincide if the correlation coefficient is
(A) $Perfect$ (b) $Only\ positive\ perfect$

(c) $Only\ negative\ perfect$ (d) all are possible

Q13. If Two regression lines coincide then possible angle between them is/are
(A) 0 and $\pi$ (b) 0 but not $\pi$ (c) $\pi$ but not 0 (d) None

Q14. The regression coefficient of X on Y is defined by

(a) $r\frac{\sigma_Y}{\sigma_X}$ (b) $\frac{\sigma_X}{r\,\sigma_Y}$ (c) $r\frac{\sigma_X}{\sigma_Y}$ (d) $r\left(\frac{\sigma_Y}{\sigma_X}\right)^2$

Q15. Using the product of two regression coefficients, which of the following statement can be stated?

(A) Only positive correlation is possible.

(B) Only Negative correlation is possible.

(C) Correlation can be either positive or negative.

(D) regression and correlation coefficient are not related.

Q16. The range of correlation and rank correlation coefficients is

(A) equal and positive but less than unity (B) equal and negative but less than zero

(C) equal and lies between negative unity to positive unity (D) not equal

Q17

For Spearman's rank correlation, if the correlation coefficient is 0.7 and $\Sigma_{i=1}^{n} d_i^2 = 49.5$ then the value of sample size 'n' is:

1. 99
2. 20
3. 10
4. 990

**Answer – 3**

**Q18**

For the two variables X and Y, the following observations are tabulated.

| | | | |
|---|---|---|---|
| X: | 3 | 4 | 4 |
| Y: | 10 | 10 | 9 |

The Spearman's correlation coefficient is:

1. -0.125
2. -0.120
3. -0.100
4. -0.110

**Answer – 1**

# Unit 3

Q1. If the mean and variance of a binomial random variable are 11.25 and 2.8125, respectively, find the number of trials.

(a) 20 (b) 10 (c) 45 (d) 15

Q2. The mean and variance of a Binomial random variable are 2 and 1.2, respectively, find $P(X = 0)$.

(a) 0.0778 (b) 0.0102 (c) 0.778 (d) 0.25

Q3. The probability of any one letter being delivered to the wrong house is 0.01. On a randomly selected day Peter delivers 1000 letters. Using a Poisson approximation, find the probability that Peter delivers 12 letters to the wrong house.
(A) 0.09478 (B) 0.06241 (C) 0.07729 (D) 0.02447

Q4. On the average, 1 in 800 computers crashes during a severe thunderstorm. A certain company had 4,000 working computers when the area was hit by a severe thunderstorm. Then the expected number of crashed computers is
(A) 10 (B) 20 (C) 5 (D) 15

Q5. Ten coins are tossed simultaneously. The probability of getting no head is

(A) $\left(\frac{1}{2}\right)^{10}$ (B) $\left(\frac{1}{10}\right)^{10}$ (C) $\left(\frac{1}{10}\right)^{2}$ (D) None

Q.6 If a random variable $X$ has a Moment generating function $M(t)=\frac{e^t}{3-2e^t}$, then mean of $X$ is given by

(a) 2 (b) -2 (c) 3 (d) None of these

Ans: (c)

Q7. Select the correct option regarding mean and variance of Poisson distribution.

(A) Mean is greater than variance. (B) Mean is less than variance.

(C) Mean is equal to variance. (D) Mean and variance both are equal to 1.

Q8. Select the correct option regarding mean and variance of Negative Binomial distribution.

(A) Mean is greater than variance. (B) Mean is less than variance.

(C) Mean is equal to variance. (D) Mean and variance both are equal to 1.

Q9. If a company producing the large number of items, then the probability of 4 defective items can be obtained by

(A) Bernoulli distribution

(B) Binomial distribution

(C) Negative Binomial distribution

(D) Poisson distribution

Q10. The moment generating function of r.v. X can be obtained from

(A) Expectation of X

(B) Variance of X

(C) Expectation of tx

(D) Expectation of exponential (tX)

Q11.

Which of the following expressions represents the moment-generating function (MGF) of the negative binomial distribution?

a) $M_X(t) = (1-p)^{k-1} \cdot p$

b) $M_X(t) = \frac{pe^t}{1-(1-p)e^t}$

c) $M_X(t) = \left(\frac{p}{1-qe^t}\right)^r$

d) $M_X(t) = \left(\frac{q}{1-pe^t}\right)^r$

**Answer – c**

**Q12**

What is the moment-generating function (MGF) of the geometric distribution?

a) $M_X(t) = \binom{k+r-1}{k} \cdot p^r \cdot q^k$

b) $M_X(t) = \left(\frac{p}{1-qe^t}\right)^r$

c) $M_X(t) = (1-p)^{k-1} \cdot p$

d) $M_X(t) = \frac{pe^t}{1-(1-p)e^t}$

**Answer – d**

3) For Poisson distribution find P(2) given $\lambda = 0.7 [e^{-0.7} = 0.497]$

a) 0.13 b) 0.14 c) 0.12 d) 0.9

Ans c

4) If x is Poisson variate such that P(x=1) =2P(x=2).Then $\lambda$ and $\sigma$ are

a) 1 and 1 b) 1 and 2 c) 4 and 2 d) 2 and 1

Ans a

**5) 8% of people are left-handed. What is the probability that 2 or more of random sample of 25 are left-handed. [e-2 = 0.1353]**

**a) 0.692 b) 0.595 c) 0.729 d) 0.525**

Ans b