Unit 1

Q1. X is a continuous random variable with probability density function (p.d.f.) f(x) , then

(a)$f(x) \geq 0$

(b)$f(x) = 0$

(c)$f(x) < 0$

(d) None of these

Q2. If f(x) is a probability density function (p.d.f.) then it should satisfy :

(a) $\int_{-\infty}^{\infty} f(x)\,dx = 0$ (b) $\int_{\infty}^{\infty} f(x)\,dx = 1$ (c) $\int_{-\infty}^{\infty} f(x)\,dx < 1$ (d) None of these

Q 3. If X is a continuous random variable , then it will assume :

(a) Only limited values in the given interval (b) all the values in the given interval

(b) Either (a) or (b) (d) None of these

Q 4. If $f(x) = x$, $0<x<1$

$= 0$, other wise

Then f(x) is a:

(a) probability density function

(b) not a probability density function

(c) either (a) or (b)

(d) None of these

Q 5. For a continuous random variable X , the c.d.f. F(a) is defined as :

(a) $P(X = a)$ (b) $P(X \leq a)$ (c) $P(X \geq a)$ (d)None of these

Q 6. The mean of continuous random variable X is defined as:

(a) $\int_{-\infty}^{\infty} x\,dx$ (b) $\int_{-\infty}^{\infty} x\,f(x)\,dx$ $\int_{\infty}^{\infty} x\,f(x)dx$ (d)None of these

Q7. r^{th} raw moment about origin μ_r' is given by :

(a) $\int_{-\infty}^{\infty} f(x)\,dx$ (b) $\int_{-\infty}^{\infty} r^x f(x)\,dx$ $\int_{-\infty}^{\infty} x^r f(x)\,dx$ (d)None of these

Q8. For a continuous random variable X , the c.d.f. $F(-\infty)$ is :

(a) 1 (b) Zero (c) - 1 (d)None of these

Q 9. For a continuous random variable X , the c.d.f. $F(\infty)$ is :

(a) Zero (b) – 1 (c) 1 (d) ∞

Q 10. If $f(x) = e^{-x}$, $x > 0$

= 0 , Otherwise, is the p.d.f. of X , then c.d.f. of X is :

(a) 1 – e (b) $1 - e^{-x}$, (c) $1 - e^{x}$, (d)None of these

Q 11. If X is a continuous random variable with c.d.f. F(x) , then $P(2< X < 6)$ is written as :

(a) F(2) – F(6) (b)F(4) - F(6) (c) F(6) – F(4) (d)F(6) – F(2)

Q12. If $f(x) = k , 0 < x < 1$

= 0 , otherwise , is p.d.f. of X , then the value of k is :

(a) 1 (b) 0 (c) 1/2 (d)None of these

Q13. If X is a continuous random variable with probability density function (p.d.f.)

$f(x) = 1 , 0<x<1$

= 0 , otherwise , then the mean of X is :

(a) 1 (b)1/2 (c) 1/12 (d)None of these

Q 14. If $f(x) = ¼ , 0 < x < 4$

= 0 , otherwise , is a p.d.f. of X, then the mean of X is

(a) 1/2 (b) 2 (c) 4 (d)None of these

Q15. If X is a continuous random variable with probability density function (p.d.f.)

$f(x) = 1 , 0<x<1$

= 0 , otherwise , then the variance of X is :

(a) 1 (b)1/2 (c) 1/12 (d)None of these

Q 16. If f(x) = 1/4 , 0 < x < 4

= 0 , otherwise, is a p.d.f. of X, then the variance of X is

(a) 1/2 (b) 2 (c) 16/3 (d)None of these

Q17. If a cumulative distribution function (c.d.f.) of a continuous random variable X is

F(x) = 1 – e^{-2x}, x ≥ 0 , then probability density function(p.d.f.) of X is :

(a) 2 e^{-2x} (b) e^{-2x} (c) 2 e^{2x} (d) e^{2x}

Q 18. If f(x) = 0.3 x + k ; - 1 < x < 1

= 0 ; otherwise, then f(x) to be a probability density function the value of k is :

(a) 1/2 (b) 3 (c) 1 (d) None of these

Q 19. If p.d.f. of a continuous random variable X is given by:

f(x) = $\frac{1}{x^2}$, 1 < x <∞

= 0 , otherwise, then P(X < 2) is :

(a) 0.5 (b) 0.75 (c) 0.25 (d) None of these

Q 20. If X is a continuous random variable with c.d.f. F(x) is given by :

F(x) = 0 , x < 0

= x^3 , 0 < x < 1

= 1 , x ≥ 1

The p.d.f. of X is :

(a) f(x) = 3x ,0<x<1 (b) f(x) =3 x^2 , 0 <x<1 (c) f(x)= x^2 ,0<x<1

= 0 , otherwise = 0 , otherwise = 0 , other wise

Q 21. The probability density function (p.d.f.) of a continuous random variable X is

f(x) = $\frac{150}{x^2}$, x ≥ 150

= 0 , otherwise , then the cumulative distribution function(c.d.f.) of X is :

(a) F(x) = 150/x (b) F(x) = x /150 (c) F(x) = 1 – (150/x) (d)None of these

Q 22. The p.d.f. of X is f(x) = 1/5 , 0 < x < 5

= 0 , other wise , then P (- 1 < X < 1) is :

(a) 1/5 (b) 0.5 (c)2/5 (d)None of these

Q 23. If for a continuous random variable X the p.d.f. is given as $f(x) = 2x$, $0 < x < 1$

$= 0$, other wise

Then $P(X > 1/2)$ is :

(a) 1/4 (b) 0.05 (c) 3/4 (d)None of these

Ans.(a)

Q 24. A real valued function associated with outcomes of a random experiment is called a _____.

a) Random variable
b) Population
c) sample
d) None of these

Q25. A random variable which takes _____ or countably infinite values occurring at intervals is called a discrete random variable.

a) Finite b) infinite c) zero d) none of the above

Q26. Which of the following is the not example of discrete random variable?

a) The number of students in a class.
b) The number of printing errors on a page.
c) Number of children in a family.
d) None of the above

Q27. Consider the following Probability mass function, find the value of 'c'.

x	-1	0	1	2	3
P(x)	c	2c	3c	4c	5c

a) 1/15 b) 1/12 c) 1/10 d) 1/13

Q28. Consider the following Probability mass function, find mean.

x	-1	0	1	2	3
P(x)	1/15	2/15	3/15	4/15	5/15

a) 5/3 b) 1/12 c) 1/10 d) 1/13

Q29. Consider the following Probability mass function, find variance.

x	-1	0	1	2	3
P(x)	1/15	2/15	3/15	4/15	5/15

a) 1/15 b) 14/9 c) 1/10 d) 1/13

30. Consider the following Probability mass function, find standard deviation.

x	-1	0	1	2	3
P(x)	1/15	2/15	3/15	4/15	5/15

a) 1.2472 b) 1.1111 c) 0.9999 d) 1.5556

Q31. Consider the following Probability mass function, find $P(X \leq 0)$.

x	-1	0	1	2	3
P(x)	1/15	2/15	3/15	4/15	5/15

a) 3/15 b) 4/15 c) 12/15 d) None of the above

Q32. Consider the following Probability mass function, find $P(X \geq 1)$.

x	-1	0	1	2	3
P(x)	1/15	2/15	3/15	4/15	5/15

a) 9/12 b) 3/15 c) 1 d) none of the above

Q33. Consider the following Probability mass function, find $P(|X| \leq 1)$.

x	-2	-1	0	1	2
P(x)	1/15	2/15	3/15	4/15	5/15

a) 9/12 b) 3/15 c) 1 d) none of the above

Q34. Which of the following is not a property of cumulative distribution function?

a) $0 \leq F(x) \leq 1$
b) $F(-\infty) = 1$
c) $F(\infty) = 1$
d) F(x) is monotonically non decreasing function.

Q35. Which of the following is a property of cumulative distribution function?

a) $0 > F(x) > 1$
b) $F(-\infty) = 1$
c) $F(\infty) = 0$
d) F(x) is monotonically non decreasing function.

Q36. If X is a discrete random variable. E(x) = 5 then find E(2x).

a) 10 b) 15 c) 5 d) None of the above

Q37. If X is a discrete random variable. E(x) = 5 then find E(2x+3).

a) 13 b) 15 c) 5 d) None of the above

Q38. If X is a discrete random variable. V(x) = 5 then find V(2x).

a) 13 b) 15 c) 20 d) None of the above

Q39. If X is a discrete random variable. V(x) = 5 then find V(2x+3).

a) 13 b) 15 c) 20 d) None of the above

Q40. If X follows binomial distribution with parameters n=10 and p=0.4 then find mean.

a) 2 b) 4 c) 6 d) 10

Q41. If X follows binomial distribution with parameters n=10 and p=0.4 then find variance.

a) 2.4 b) 4 c) 6 d) 10

Q42. If X follows binomial distribution with parameters n=10 and p=0.4 then find standard deviation.

a) 2.4 b) 1.55 c) 6 d) 10

Q43. If X follows binomial distribution with parameters n= 10 and p=0.4 and Y follows binomial distribution with parameters n= 20, p=0.4 then what is the distribution of X+Y?

a) Bin(30, 0.4)
b) Bin(30, 0.8)
c) Bin (20,0.8)
d) Bin(10,0.8)

Q44. An unbiased coin is tossed five times. What is the probability of getting exactly two heads?

a) 5/16 b) 6/16 c) 11/16 d) None of the above

Q45. An unbiased coin is tossed five times. What is the probability of getting at least two heads?

a) 5/16 b) 6/16 c) 13/16 d) None of the above

Q46. The mean of a Standard Normal distribution is :

a. 0 b. 1 c. 2 d. 3

Q47. The standard deviation of a Standard Normal distribution is :

a. 0 b. 1 c. 2 d. 3

Q48. If X follows normal distribution with parameters (10, 25) then what is mean?

a. 10 b. 25 c. 5 d. None of the above

Q49. If X follows normal distribution with parameters (10, 25) then what is variance?

a. 10 b. 25 c. 5 d. None of the above

Q50. If X follows normal distribution with parameters (10, 25) then what is standard deviation?

a. 10 b. 25 c. 5 d. None of the above

Q51. If x follows normal distribution with parameters (0,1), find P(Z>2.53).

a) 0.5057 b) 1 c) 0 d) none of the above

Q52. If x follows normal distribution with parameters (0,1), find P(Z<-1.04).

a) 0.5057 b) 0.1492 c) 0.3508 d) none of the above

Q53. If x follows normal distribution with parameters (0,1), find P(-1.38 < Z< 1.21).

a) 0.5057 b) 1 c) 0.8031 d) none of the above

Q54. If x follows normal distribution with parameters (0,1), find P(-2.12< Z< 2.08).

a) 0.5057 b) 1 c) 0.0018 d) none of the above

Q55. If x follows normal distribution with parameters (0,1), find P(1.39< Z< 2.11).

a) 0.5057 b) 1 c) 0.0649 d) none of the above

Q56. If X follows normal distribution with parameters (30, 7) fine P(X>35).

a) 0.2389 b) 0.3859 c) 0.9543 d) None of the above

Q57. If X follows normal distribution with parameters (30, 7) fine P(X<28).

a) 0.2389 b) 0.3859 c) 0.9543 d) None of the above

Q58. If X follows normal distribution with parameters (30, 7) fine P(10<X<32).

a) 0.2389
b) 0.3859
c) 0.9543
d) None of the above

Q59. If X follows normal distribution with parameters (30, 7) fine P(33<X<45).

a) 0.2389
b) 0.3859
c) 0.9543
d) None of the above

Q60. If X follows normal distribution with parameters (30, 7) fine P(15<X<25).

a) 0.2389
b) 0.3859
c) 0.9543
d) None of the above

Unit 2

Q1. A statement made about a population for testing purpose is called?

a) Statistic
b) Hypothesis
c) Level of Significance
d) Test-Statistic

Q2. A statement whose validity is tested on the basis of a sample is called?

a) Null Hypothesis
b) Statistical Hypothesis
c) Simple Hypothesis
d) Composite Hypothesis

Q3. A randomly selected sample of 1,000 college students was asked whether they had ever used the drug Ecstasy. Sixteen percent (16% or 0.16) of the 1,000 students surveyed said they had. Which one of the following statements about the number 0.16 is correct?

A. It is a sample proportion.

B. It is a population proportion.

C. It is a sample mean.

D. It is population mean.

Q4. A company manufacturing tube lights claims that the average life of tube lights is at least 1800 hours. The average life and standard deviation of random sample of 100 such tube lights were 1760 hours and 140 hours respectively. What is the hypothesis for this test?

a) H_0: μ ≥ 1800 v/s H_1: μ < 1800
b) H_0: μ > 1800 v/s H_1: μ < 1800
c) H_0: μ = 1800 v/s H_1: μ > 1800
d) None of the above

Q5. A company manufacturing tube lights claims that the average life of tube lights is at least 1800 hours. The average life and standard deviation of random sample of 100 such tube lights were 1760 hours and 140 hours respectively. What is the test statistic for this test?

a) -2.8571
b) -1.8571
c) 2.8571
d) -2.5601

Q6. A company manufacturing tube lights claims that the average life of tube lights is at least 1800 hours. The average life and standard deviation of random sample of 100 such tube lights were 1760 hours and 140 hours respectively. What is the table value for this test?

a) 1.64
b) 1.96
c) -1.64
d) -1.96

Q7. An examination was given to two random samples of students of two classes consisting of 40 and 50 students respectively. In the first class the mean of marks was 74 with a standard deviation of 8, while in the second class the mean of marks was 78 with a standard deviation of 7. What is the appropriate hypothesis for this test?

a) $H_0: \mu_1 = \mu_2$ v/s $H_1: \mu_1 > \mu_2$
b) $H_0: \mu_1 = \mu_2$ v/s $H_1: \mu_1 < \mu_2$
c) $H_0: \mu_1 = \mu_2$ v/s $H_1: \mu_1 \neq \mu_2$
d) None of the above

Q8. An examination was given to two random samples of students of two classes consisting of 40 and 50 students respectively. In the first class the mean of marks was 74 with a standard deviation of 8, while in the second class the mean of marks was 78 with a standard deviation of 7. What is the test statistic for this test?

a) -2.49
b) 2.49
c) 1.5
d) -1.5

Q9. An examination was given to two random samples of students of two classes consisting of 40 and 50 students respectively. In the first class the mean of marks was 74 with a standard deviation of 8, while in the second class the mean of marks was 78 with a standard deviation of 7. What is the table value for this test?

a) 1.64
b) 1.96
c) -1.64
d) -1.96

Q10. In order to find whether a coin is unbiased, it is tossed 200 times. It showed 110 heads. What will be the appropriate hypothesis?

a) $H_0: P = \frac{1}{2}$ v/s $H_1: P > 1/2$

b) $H_0: P = 1/4$v/s $H_1: P < 1/4$
c) $H_0: P = 1/2$ v/s $H_1: P \neq 1/2$
d) None of the above

Q11. In order to find whether a coin is unbiased, it is tossed 200 times. It showed 110 heads. What will be the test statistic for this test?

a) 1.4142
b) -1.4142
c) 2.1212
d) -2.1212

Q12. In order to find whether a coin is unbiased, it is tossed 200 times. It showed 110 heads. What will be the table value for this test?

a) 1.64
b) 1.96
c) -1.64
d) -1.96

Q13. In a simple random sample of 900 men taken from a big city, 360 are found to be smokers. In another simple random sample of 600 mean taken from another city 210 are smokers. What is the appropriate hypothesis for this test?

a) H0: P1=P2 v/s H1: P1> P2
b) H0: P1=P2 v/s H1: P1< P2
c) H0: P1=P2 v/s H1: P1≠ P2
d) None of the above

Q14. In a simple random sample of 900 men taken from a big city, 360 are found to be smokers. In another simple random sample of 600 mean taken from another city 210 are smokers. What is the test statistic for this test?

a) 1.9545
b) -1.9545
c) 2.9545
d) -2.9545

Q15. In a simple random sample of 900 men taken from a big city, 360 are found to be smokers. In another simple random sample of 600 mean taken from another city 210 are smokers. What is the table value for this test?

a) 1.64
b) 1.96
c) -1.64
d) -1.96

Q16. The average height of 50 students in a college with 4000 students is 65 inches. The standard deviation of height is 3 inches, find 95% lower confidence limit for average interval height of all college students.

a) 64.1000

b) 64.2000
c) 63.1271
d) 64.1684

Q17. The average height of 50 students in a college with 4000 students is 65 inches. The standard deviation of height is 3 inches, find 95% upper confidence limit for average interval height of all college students.

a) 65.4559
b) 64.9999
c) 65.8316
d) 64.1684

Answer: c) 65.8316

Q18. A sample of 400 screws was inspected. 30 of them were found to be defective Obtain 90% lower confidence limit for the proportion of defective screws produced.

a) 0.0534
b) 0.4650
c) 0.1234
d) 0.5621

Q19. A sample of 400 screws was inspected. 30 of them were found to be defective Obtain 90% upper confidence limit for the proportion of defective screws produced.

a) 0.0966
b) 0.0856
c) 0.7231
d) 0.0621

Q20. In a town, out of 10, 00,000 people, 900 people were interviewed and of them 60 had education beyond graduation. Obtain 95% lower confidence limit for the proportion of people educated beyond graduation.

a) 0.5204
b) 0.4125
c) 0.0504
d) 0.0423

Q21. In a town, out of 10, 00,000 people, 900 people were interviewed and of them 60 had education beyond graduation. Obtain 95% upper confidence limit for the proportion of people educated beyond graduation.

a) 0.0830
b) 0.1235
c) 0.9563
d) 0.4531

Q22. What is type I error?

a) P(Reject null hypothesis/ Null hypothesis is true)
b) P(Reject alternative hypothesis/ Null hypothesis is true)
c) P(Reject null hypothesis/ Alternative hypothesis is true)
d) P(Reject alternative hypothesis/ Alternative hypothesis is true)

Q23. What is type II error?

a) P(Do not reject null hypothesis/ Null hypothesis is true)
b) P(Do not reject null hypothesis / Alternative hypothesis is true)
c) P(Reject null hypothesis/ Alternative hypothesis is true)
d) P(Reject alternative hypothesis/ Alternative hypothesis is true)

Q24. What is power of test?

a) P(Do not reject null hypothesis/ Null hypothesis is true)
b) P(Do not reject null hypothesis / Alternative hypothesis is true)
c) P(Reject null hypothesis/ Alternative hypothesis is true)
d) P(Reject alternative hypothesis/ Alternative hypothesis is true)

Q25. The average height of 10 males of a given locality is 66 inches and sample standard deviation is 10. Is it reasonable to believe that the average height is greater than 64 inches? What will be the appropriate hypothesis?

a) H0: $\mu = 64$ inches v/s H1: $\mu > 64$ inches
b) H0: $\mu = 64$ inches v/s H1: $\mu < 64$ inches
c) H0: $\mu = 64$ inches v/s H1: $\mu \neq 64$ inches
d) None of the above

Q26. The average height of 10 males of a given locality is 66 inches and sample standard deviation is 10. Is it reasonable to believe that the average height is greater than 64 inches? What will be the test statistic value for this test?

a) 1.8974
b) 1.9645
c) 1.4586
d) 2.0123

Q27. The average height of 10 males of a given locality is 66 inches and sample standard deviation is 10. Is it reasonable to believe that the average height is greater than 64 inches? What will be the table value for this test?

a) 1.833
b) 1.456
c) 1.238
d) 1.298

Q28. The following table shows the lives (in hours) of four batches of electric lamps:

Batches	Life of Bulbs in hours
1	1600,1610,1650,1680,1700,1720,1800
2	1580,1640,1640,1700,1750
3	1460,1550,1600,1620,1640,1660,1740,1820
4	1510,1520,1530,1570,1600,1680,

What will be the error degrees of freedom for this analysis where we can check batches are homogeneous or not.

a) 22
b) 4
c) 25
d) 26

Q29. The following table shows the lives (in hours) of four batches of electric lamps:

Batches	Life of Bulbs in hours
1	1600,1610,1650,1680,1700,1720,1800
2	1580,1640,1640,1700,1750
3	1460,1550,1600,1620,1640,1660,1740,1820
4	1510,1520,1530,1570,1600,1680,

What will be the total degrees of freedom for this analysis where we can check batches are homogeneous or not?

a) 22
b) 4
c) 25
d) 26

Q30. The following table shows the lives (in hours) of four batches of electric lamps:

Batches	Life of Bulbs in hours
1	1600,1610,1650,1680,1700,1720,1800
2	1580,1640,1640,1700,1750
3	1460,1550,1600,1620,1640,1660,1740,1820
4	1510,1520,1530,1570,1600,1680,

What will be the batches (treatment) degrees of freedom for this analysis where we can check batches are homogeneous or not?

a) 5
b) 4
c) 3
d) 26

Q31. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	4	92.32
Error	----	-----
Total	39	2424.81

What is the Sum of square for error?

a) 2332.49
b) 2224.2
c) 2012.23
d) None of the above

Q32. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	4	-----
Error	----	2332.49
Total	39	2424.81

What is the Sum of square for treatment?

a) 2332.49
b) 2224.2
c) 2012.23
d) None of the above

Q33. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	4	92.32
Error	----	2332.49
Total	39	----

What is the Total Sum of square?

a) 2424.81
b) 2224.2
c) 2012.23
d) None of the above

Q34. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of squares
Treatment	4	----	-----
Error	35	2332.49	
Total	39	2424.81	

What is the mean sum of square for treatment?

a) 23.08
b) 66.63
c) 92.32
d) None of the above

Q35. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of squares
Treatment	4	----	-----
Error	35	2332.49	-----
Total	39	2424.81	

What is the mean sum of square for error?

a) 23.08
b) 66.64
c) 92.32
d) None of the above

Q36. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F cal
Treatment	4	92.32	-----	-----
Error	35	2332.49	----	
Total	39	2424.81		

What is the Fcal value for treatments?

a) 2.89
b) 2.81
c) 2.79
d) 2.99

Q37. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	----	400
Block	----	6810
Error	36	----
Total	49	9948

What is the treatment degrees of freedom?

a) 4
b) 9
c) 12
d) 20

Q38. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	----	400
Block	----	6810
Error	36	----
Total	49	9948

What is the block degrees of freedom?

a) 4

b) 9
c) 12
d) 20

Q39. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	4	400
Block	9	6810
Error	----	----
Total	49	9948

What is the error degrees of freedom?

a) 4
b) 9
c) 36
d) 20

Q40. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	4	----
Block	9	6810
Error	----	2738
Total	49	9948

What is the treatment sum of square?

a) 400
b) 450
c) 425
d) 455

Q41. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	4	400
Block	9	----
Error	----	2738
Total	39	9948

What is the block sum of square?

a) 6610
b) 6810
c) 6740
d) 6500

Q42. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares
Treatment	4	400
Block	9	6810
Error	----	----

Total	39	9948

What is the sum of square error?

a) 2568
b) 2868
c) 2738
d) 2840

Q43. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of square
Treatment	4	0.043	----
Block	----	0.796	----
Error	8	----	----
Total	14	0.976	

What is the mean sum of square treatment?

a) 0.0108
b) 0.0123
c) 0.0190
d) 0.0118

Q44. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of square
Treatment	4	0.043	----
Block	----	0.796	----
Error	8	----	----
Total	14	0.976	

What is the mean sum of square block?

a) 0.3980
b) 0.3880
c) 0.3780
d) 0.3680

Q45. Consider the following ANOVA table:

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of square
Treatment	4	0.043	----
Block	----	0.796	----
Error	8	0.137	----
Total	14	0.976	

What is the mean error sum of square?

a) 0.0171
b) 0.0728

c) 0.0124
d) 0.0896

Unit 3

Q1. Which of the following is not the advantage of non-parametric test?

a) Easily understandable

b) Short calculations

c) Assumption of distribution is required

d) Applicable to all types of data

Q2. In_____ test data is converted into series of plus and minus sings for analysis.

a) Sign test

b) Kruskal Wallis one way ANOVA

c) One sample run test

d) None of the above

Q3. Which non parametric test is the alternative of parametric one way ANOVA?

a) Sing test
b) Kruskal Wallis test
c) One sample run test
d) None of the above

Q4. The transit time per second in 11 patients having occluded right coronary arteries are given below

Subject	1	2	3	4	5	6	7	8	9	10	11
Transit time per second	1.8	3.3	5.65	2.25	2.5	3.5	2.75	3.25	3.10	2.7	3.0

What will be the number of positive signs will occur for testing whether transit time is 3.5 against the alternative that it is less than 3.5?

a) 1
b) 9
c) 10
d) 0

Q5. The transit time per second in 11 patients having occluded right coronary arteries are given below

Subject	1	2	3	4	5	6	7	8	9	10	11
Transit time per second	1.8	3.3	5.65	2.25	2.5	3.5	2.75	3.25	3.10	2.7	3.0

What will be the number of negative signs will occur for testing whether transit time is 3.5

against the alternative that it is less than 3.5?

a) 1
b) 9
c) 10
d) 0

Q6. The transit time per second in 11 patients having occluded right coronary arteries are given below

Subject	1	2	3	4	5	6	7	8	9	10	11
Transit time per second	1.8	3.3	5.65	2.25	2.5	3.5	2.75	3.25	3.10	2.7	3.0

What will be the test statistic for testing whether transit time is 3.5 against the alternative that it is less than 3.5?

a) T_+
b) T_-
c) T
d) None of the above

Q7. The transit time per second in 11 patients having occluded right coronary arteries are given below

Subject	1	2	3	4	5	6	7	8	9	10	11
Transit time per second	1.8	3.3	5.65	2.25	2.5	3.5	2.75	3.25	3.10	2.7	3.0

What will be the number of positive signs will occur for testing whether transit time is 3.5 against the alternative that it is not equal to 3.5?

a) 1
b) 9
c) 10
d) 0

Q8. The transit time per second in 11 patients having occluded right coronary arteries are given below

Subject	1	2	3	4	5	6	7	8	9	10	11
Transit time per second	1.8	3.3	5.65	2.25	2.5	3.5	2.75	3.25	3.10	2.7	3.0

What will be the number of negative signs will occur for testing whether transit time is 3.5 against the alternative that it is not equal to 3.5.?

a) 1
b) 9
c) 10

d) 0

Q9. The transit time per second in 11 patients having occluded right coronary arteries are given below

Subject	1	2	3	4	5	6	7	8	9	10	11
Transit time per second	1.8	3.3	5.65	2.25	2.5	3.5	2.75	3.25	3.10	2.7	3.0

What will be the test statistic for testing whether transit time is 3.5 against the alternative that it is not equal to 3.5?

a) T_+
b) T_-
c) T_+ or T_-
d) None of the above

Q10. Iwamoto found that the mean weight of a sample of a particular species of adult female monkeys from a certain area was 8.41 kg. Weight of female monkeys have been given below. What will be the number of positive signs occurs for testing that median weight of population is greater than 8.41 kg?
8.3, 9.5, 9.6, 8.75, 8.4, 9.1, 9.25, 9.8, 10.05, 8.15, 10, 9.61, 9.8, 9.2, 9.3

a) 12
b) 3
c) 15
d) None of the above

Q11. Iwamoto found that the mean weight of a sample of a particular species of adult female monkeys from a certain area was 8.41 kg. Weight of female monkeys have been given below. What will be the number of negative signs occurs for testing that median weight of population is greater than 8.41 kg?
8.3, 9.5, 9.6, 8.75, 8.4, 9.1, 9.25, 9.8, 10.05, 8.15, 10, 9.61, 9.8, 9.2, 9.3

a) 12
b) 3
c) 15
d) None of the above

Q12. Iwamoto found that the mean weight of a sample of a particular species of adult female monkeys from a certain area was 8.41 kg. Weight of female monkeys have been given below. What will be the number of negative signs occurs for testing that median weight of population is greater than 8.41 kg?
8.3, 9.5, 9.6, 8.75, 8.4, 9.1, 9.25, 9.8, 10.05, 8.15, 10, 9.61, 9.8, 9.2, 9.3

a) T_+
b) T_-
c) T_+ or T_-
d) None of the above

Q13. Departure from normal of daily temperatures in a city are given below (in degree Celsius).
12,13,10,7,3,2,6,7,5,-1,-2,-4,-7,-2,-2,1,2, 3 ,-4, -6, 12, 13, 14
What is the total number of runs present in following sequence?

a) 5
b) 6
c) 10
d) 15

Q14. Departure from normal of daily temperatures in a city are given below (in degree Celsius).What will be the decision criterion for testing randomness of data?
12,13,10,7,3,2,6,7,5,-1,-2,-4,-7,-2,-2,1,2, 3 ,-4, -6, 12, 13, 14

a) Reject Ho when there are too many runs (r>= r2)
b) Reject Ho when there are too few runs (r<= r1)
c) Reject Ho when there are too many (r>= r2) or too few runs(r<= r1)
d) None of the above

Q15. For sign test, the data available for analysis consists of a sequence of observations recorded in the order of their occurrence which we can classify into _____ types.

a) Two mutually exclusive
b) Three mutually exclusive
c) Four mutually exclusive
d) None of the above

Q16. Median nerve motor conduction velocity (meters per second) in 2 groups of subjects were observed.
Control(X): 68 67 58 62 55 60 67
Experimental Subjects(Y): 60 59 72 73 56 53 43 50
What is the total number of runs present for the above data?

a) 8
b) 7
c) 9
d) None of the above

Q17. Median nerve motor conduction velocity (meters per second) in 2 groups of subjects were Observed. What will be the hypothesis to check whether data provide sufficient evidence to indicate that populations represented by the two samples have different distributions ?
Control(X): 68 67 58 62 55 60 67
Experimental Subjects(Y): 60 59 72 73 56 53 43 50

a) Ho: The pattern of occurrence is random against H1: There are too many runs (Cyclic trend)
b) Ho: The pattern of occurrence is random against H1: There are too few runs (Linear trend)
c) Ho: The pattern of occurrence is random against H1: The pattern of occurrence is not random
d) None of the above

Q18. Median nerve motor conduction velocity (meters per second) in 2 groups of subjects were Observed. What will be the test statistic for checking whether data provide sufficient evidence to indicate that populations represented by the two samples have different distributions?
Control(X): 68 67 58 62 55 60 67
Experimental Subjects(Y): 60 59 72 73 56 53 43 50

a) Reject Ho when there are too many runs (r>= r2)
b) Reject Ho when there are too few runs (r<= r1)
c) Reject Ho when there are too many (r>= r2) or too few runs(r<= r1)
d) None of the above

Q19. Houses were allocated to people through a lottery system. But some people who were not allocated houses complained that the process was not random and favoured those from a particular region R. Data of a sample of 25 houses allocated to people from region(R) and other regions (O) on a day selected randomly are given below-
RRROORROORRORRRORRROORRR.
What is the total number of runs present for the above data?

a) 11
b) 12
c) 25
d) 10

Q20. Houses were allocated to people through a lottery system. But some people who were not allocated houses complained that the process was not random and favoured those from a particular region R. Data of a sample of 25 houses allocated to people from region(R) and other regions (O) on a day selected randomly are given below-
RRROORROORRORRRORRROORRR.
What will be the hypothesis?

a) Ho: The pattern of occurrence is random against H1: There are too many runs (Cyclic trend)

b) Ho: The pattern of occurrence is random against H1: There are too few runs (Linear trend)
c) Ho: The pattern of occurrence is random against H1: The pattern of occurrence is not random
d) None of the above

Q21. Houses were allocated to people through a lottery system. But some people who were not allocated houses complained that the process was not random and favoured those from a particular region R. Data of a sample of 25 houses allocated to people from region(R) and other regions (O) on a day selected randomly are given below-
RRROORROORRORRRORRROORRR.
What will be the test statistic?

a) Reject Ho when there are too many runs (r>= r2)
b) Reject Ho when there are too few runs (r<= r1)
c) Reject Ho when there are too many (r>= r2) or too few runs(r<= r1)
d) None of the above

Q22. Which of the following is not the assumption of Kruskal Wallis one way Anova?

a) The data available for analysis consists of k random samples of sizes n1,n2,….nk
b) Variable of interest is measured on at least an ordinal scale.
c) Variable of interest is continuous.
d) The observations are dependent from within and among samples.

Q23. In Kruskal Wallis one way Anova test statistic follows Chi-square distribution with _____ degrees of freedom if there are k independent groups.

a) k
b) k-1
c) k+1
d) None of the above

Q24. What is the hypothesis of Kruskal Wallis one way Anova test?

a) H0 : The k population distribution functions are identical H1 : The k population do not have the same median
b) H0 : The k population distribution functions are identical H1 : The k population do not have the same mean
c) H0 : The k population distribution functions are identical H1 : The k population do not have the same mode
d) None of the above

Q25. Antecubital vein cortisol levels in three groups of patients who delivered between 38 and

42 weeks is shown below.

Group I	262	307	211	323	454	339	304	154	287	356
Group II	465	501	455	355	468	362				
Group III	343	772	207	1048	838	687				

What is the sum of ranks of group I?

a) 69
b) 90
c) 94
d) 100

Q26. Antecubital vein cortisol levels in three groups of patients who delivered between 38 and 42 weeks is shown below.

Group I	262	307	211	323	454	339	304	154	287	356
Group II	465	501	455	355	468	362				
Group III	343	772	207	1048	838	687				

What is the sum of ranks of group II?

a) 69
b) 90
c) 94
d) 100

Q27. Antecubital vein cortisol levels in three groups of patients who delivered between 38 and 42 weeks is shown below.

Group I	262	307	211	323	454	339	304	154	287	356
Group II	465	501	455	355	468	362				
Group III	343	772	207	1048	838	687				

What is the sum of ranks of group III?

a) 69
b) 90
c) 94
d) 100

Q28. Sum of the ranks for Antecubital vein cortisol levels in three groups of patients who delivered between 38 and 42 weeks is shown below. This study was conducted on 22 patients which belongs to 3 different groups. R1 = 69 R2= 90 R3= 94
What is the test statistic H value?

a) 9.2341
b) 8.2546

c) 6.7863
d) 10.9865

Q29. A shoe company wants to know if three groups of workers have different salaries:

Women	23000, 41000, 54000, 66000, 78000
Men	45000, 55000, 60000, 70000, 72000
Minorities	18000, 30000, 34000 40000, 44000

What is the sum of ranks of women group?

a) 44
b) 56
c) 20
d) 10

Q30. A shoe company wants to know if three groups of workers have different salaries:

Women	23000, 41000, 54000, 66000, 78000
Men	45000, 55000, 60000, 70000, 72000
Minorities	18000, 30000, 34000 40000, 44000

What is the sum of ranks of men group?

a) 44
b) 56
c) 20
d) 10

Q31. A shoe company wants to know if three groups of workers have different salaries:

Women	23000, 41000, 54000, 66000, 78000
Men	45000, 55000, 60000, 70000, 72000
Minorities	18000, 30000, 34000 40000, 44000

What is the sum of ranks of minorities group?

a) 44
b) 56
c) 20
d) 10

Q32. A shoe company wants to know if three groups of workers have different salaries.

Women	23 K, 41 K, 54 K, 66 K, 78 K
Men	45 K, 55 K, 60 K, 70 K, 72 K
Minorities	18 K, 30 K, 34 K 40 K, 44 K

Sum of the ranks of 3 groups are given below.
R1= 20 R2=44 R3= 56
What is the value of test statistic H for this test?

a) 6.72
b) 10.57

c) 15.23
d) 20.78

Q33. In a manufacturing unit, four teams of operators were randomly selected and sent to four different facilities for machining techniques training. After the training, the supervisor conducted the exam and recorded the test scores.

Facility 1	Facility 2	Facility 3	Facility 4
88	77	71	52
82	76	56	65
86	84	64	68
87	59	51	81

What is the sum of the rank of scores given by facility 1?

a) 57
b) 36
c) 17
d) 26

Q34. In a manufacturing unit, four teams of operators were randomly selected and sent to four different facilities for machining techniques training. After the training, the supervisor conducted the exam and recorded the test scores.

Facility 1	Facility 2	Facility 3	Facility 4
88	77	71	52
82	76	56	65
86	84	64	68
87	59	51	81

What is the sum of the rank of scores given by facility 2?

a) 57
b) 36
c) 17
d) 26

Q35. In a manufacturing unit, four teams of operators were randomly selected and sent to four different facilities for machining techniques training. After the training, the supervisor conducted the exam and recorded the test scores.

Facility 1	Facility 2	Facility 3	Facility 4
88	77	71	52
82	76	56	65
86	84	64	68
87	59	51	81

What is the sum of the rank of scores given by facility 3?

a) 57
b) 36
c) 17

d) 26

Q36. In a manufacturing unit, four teams of operators were randomly selected and sent to four different facilities for machining techniques training. After the training, the supervisor conducted the exam and recorded the test scores.

Facility 1	Facility 2	Facility 3	Facility 4
88	77	71	52
82	76	56	65
86	84	64	68
87	59	51	81

What is the sum of the rank of scores given by facility 4?

a) 57
b) 36
c) 17
d) 26

Q37. In a manufacturing unit, four teams of operators were randomly selected and sent to four different facilities for machining techniques training. After the training, the supervisor conducted the exam and recorded the test scores.

Facility 1	Facility 2	Facility 3	Facility 4
88	77	71	52
82	76	56	65
86	84	64	68
87	59	51	81

Sum of the ranks of 4 facilities groups are given below.
R1= 26 R2=17 R3= 36 R4= 57
What is the value of test statistic H for this test?

a) 9.77
b) 5.77
c) 8.77
d) 10.77

Q38. During a 6 month period, a new salesperson in an insurance company spent an average of 119 hours per month in the field. Given below are the average number of hours per month spent by this person in the field in 6 months. Test if median is 119 against median more than 119 using Wilcoxon's test. What will be the hypothesis?

a) Ho : M = 119 against H1 : M > 119
b) Ho : M = 119 against H1 : M < 119
c) Ho : M = 119 against H1 : M ≠ 119
d) None of the above

Q39. During a 6 month period, a new salesperson in an insurance company spent an average of 119 hours per month in the field. Given below are the average number of hours per month spent by this person in the field in 6 months. Test if median is 119 against median more than 119 using Wilcoxon's test. What will be the sum of ranks of positive signs?

136, 103, 91, 122, 96, 145, 140, 138, 126, 120, 99, 125, 92, 143, 119, 137

a) 56
b) 25
c) 78
d) None of the above

Q40. During a 6 month period, a new salesperson in an insurance company spent an average of 119 hours per month in the field. Given below are the average number of hours per month spent by this person in the field in 6 months. Test if median is 119 against median more than 119 using Wilcoxon's test. What will be the sum of ranks of negative signs?

136, 103, 91, 122, 96, 145, 140, 138, 126, 120, 99, 125, 92, 143, 119, 137

a) 56
b) 57
c) 42
d) None of the above

Q41. During a 6 month period, a new salesperson in an insurance company spent an average of 119 hours per month in the field. Given below are the average number of hours per month spent by this person in the field in 6 months. Test if median is 119 against median more than 119 using Wilcoxon's test. What will be the test statistic for this test?

136, 103, 91, 122, 96, 145, 140, 138, 126, 120, 99, 125, 92, 143, 119, 137

a) T+
b) T-
c) T
d) None of the above

Q42. In a study of drug abuse in a suburban area, it was found that Median IQ of drug abusers who were 16 years of age and above was 107. A researcher wants to conclude from the data of arrested drug abusers who are aged 16 and above is different from 107.

99, 100, 90, 94, 135, 108, 107, 111, 119, 104, 127, 109, 117, 102, 125

What will be the hypothesis?

a) Ho : M = 107 against H1 : M > 107
b) Ho : M = 107 against H1 : M < 107
c) Ho : M = 107 against H1 : M ≠ 107
d) None of the above

Q43. In a study of drug abuse in a suburban area, it was found that Median IQ of drug abusers who were 16 years of age and above was 107. A researcher wants to conclude from the data of arrested drug abusers who are aged 16 and above is different from 107. What will be the sum of ranks of positive signs?

99, 100, 90, 94, 135, 108, 107, 111, 119, 104, 127, 109, 117, 102, 125

a) 56
b) 25
c) 78
d) None of the above

Q44. . In a study of drug abuse in a suburban area, it was found that Median IQ of drug abusers who were 16 years of age and above was 107. A researcher wants to conclude from the data of arrested drug abusers who are aged 16 and above is different from 107. What will be the sum of ranks of negative signs?

99, 100, 90, 94, 135, 108, 107, 111, 119, 104, 127, 109, 117, 102, 125

a) 56
b) 25
c) 78
d) None of the above

Q45. . In a study of drug abuse in a suburban area, it was found that Median IQ of drug abusers who were 16 years of age and above was 107. A researcher wants to conclude from the data of arrested drug abusers who are aged 16 and above is different from 107. What will be the test statistic for this test?

99, 100, 90, 94, 135, 108, 107, 111, 119, 104, 127, 109, 117, 102, 125

a) T+
b) T-
c) T
d) None of the above

Q46. Which of the following is not the assumption of Wilcoxon test?

a) The sample available for analysis is a random sample from a population with unknown median
b) Variable of interest is measured on at least an interval scale.
c) Variable of interest is continuous
d) The observations are dependent.

Q47. _____ test takes into consideration not only the signs but also the magnitude of the differences.

a) Wilcoxon sign rank test
b) Sign test
c) One sample run test
d) None of the above