

SHIVAJI UNIVERSITY, KOLHAPUR

B. Sc. Part-II: Semester-IV (CBCS)

SUBJECT: STATISTICS-VIII DSC-8D: Statistical Methods-II

Subject Code - 78912

Question Bank

Multiple Choice Questions (MCQ)

Time Series

1. The long-term regular movements in a time series are called
 - a) seasonal variations
 - b) cyclical variations
 - c) secular trend
 - d) irregular variations
2. Time series analysis helps to.....
 - a) make predictions
 - b) compare two or more series
 - c) know behavior of business
 - d) all of these
3. If all four components of time series operate independently then we use
 - a) additive model
 - b) multiplicative model
 - c) exponential model
 - d) none of these
4. Negligence of an operator causes variation in the production process.
 - a) assignable
 - b) causes
 - c) random
 - d) assignable and chance
5. Graph of time series is called.....
 - a) Line Graph
 - b) Trend
 - c) Historigram
 - d) Histogram
6. Multiplicative model for time series is $Y=...$
 - a) $T + S + C + I$
 - b) $T - S - C - I$
 - c) $T \times S \times C \times I$
 - d) none of these
7. Seasonal variations are-----.
 - a) Sudden variations
 - b) Short term variations
 - c) Long term variations
 - d) none of these
8. A fire in a factory delaying production for some weeks is an example of -----
 - a) Seasonal variations
 - b) Cyclical variations
 - c) Irregular variations
 - d) Secular Trend
9. In the theory of time series, shortage of certain consumer goods before annual budget is due to
 - a) Cyclical Variation
 - b) Seasonal Variation
 - c) Irregular Variations
 - d) secular Trend
10. Prosperity, Recession, Depression and recovery in a business is an example of
 - a) Irregular variations
 - b) Seasonal variations
 - c) Cyclical variations
 - d) Secular Trend
11. Additive model for time series $Y=...$
 - a) $T+S+C+I$
 - b) $T - S - C - I$
 - c) $T \times S \times C \times I$
 - d) none of these
12. A Time Series hascomponents.
 - a) one
 - b) two
 - c) three
 - d) four

Statistical Quality Control (SQC)

13. Variation in the items produced in a factory may be due to
- a) assignable causes
 - b) chance causes
 - c) both (a) and (b)
 - d) none of these
14. Control chart for the fraction defectives is based on -----distribution.
- a) Poisson
 - b) Binomial
 - c) Hypergeometric
 - d) Geometric
15. Chance or random variations in the manufactured product are
- a) Controllable
 - b) not controllable
 - c) Both (a) and (b)
 - d) none of these
16. The variation due to assignable causes in the product occurs due to -----
- a) Faulty process
 - b) carelessness of the operator
 - c) Poor quality of raw material
 - d) all of these
17. The variation due to assignable causes -----
- a) can be removed
 - b) cannot be removed
 - c) can sometimes be removed
 - d) all of these
18. The statistical quality control charts were devised by
- a) R. A. Fisher
 - b) W. S. Gosset
 - c) Karl Pearson
 - d) W. A. Shewhart
19. The mean and range charts are based on -----
- a) Chi-square distribution
 - b) Binomial distribution
 - c) Normal distribution
 - d) Poisson distribution
20. Control chart for the number of defects (c-chart) is based on -----
- a) Chi-square distribution
 - b) Binomial distribution
 - c) Normal distribution
 - d) Poisson distribution
21. Control chart for number of defectives (p-chart) is based on -----
- a) Chi-square distribution
 - b) Binomial distribution
 - c) Normal distribution
 - d) Poisson distribution
22. The process under control is operating in the presence of -----
- a) only assignable causes
 - b) only chance causes
 - c) both assignable and chance causes
 - d) none of these
23. The process which is out of control is operating in the presence of -----
- a) only assignable causes
 - b) only chance causes
 - c) both assignable and chance causes
 - d) none of these
24. Which of the following causes of variations can be identified and removed from the process?
- a) only assignable causes
 - b) only chance causes
 - c) both assignable and chance causes
 - d) none of these
25. Which among the following is a type of control chart for variables?
- a) p-chart
 - b) c- chart
 - c) mean
 - d) u-chart

Testing of Hypothesis-I

26. Critical region is a region of
- a) rejection for H_0
 - b) acceptance for H_0
 - c) rejection for either H_0 or H_1
 - d) rejection for both H_0 and H_1

27. Testing $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 < \mu_2$ is a test.
- a) one-sided left-tailed b) one-sided right-tailed
c) two-tailed d) none of these
28. Type I error is
- a) accepting H_0 when it is false b) rejecting H_0 when it is false
c) accepting H_0 when it is true d) rejecting H_0 when it is true
29. Hypotheses may be classified as -----
- a) simple b) composite c) null d) all of these
30. Any hypothesis which is complementary to null hypothesis is.....
- a) Simple hypothesis b) composite hypothesis
c) Alternative hypothesis d) none of these
31. Type - II error occurs when we
- a) reject a false null hypothesis b) reject a true null hypothesis
c) do not reject a false null hypothesis d) do not reject a true null hypothesis
32. In hypothesis testing, the level of significance is
- a) the probability of committing a Type II error
b) the probability of committing a Type I error
c) the probability of either a Type I or Type II, depending on the hypothesis to be tested
d) none of the above
33. Which of the following test of hypothesis is one-sided test?
- a) $H_0: \sigma_1^2 = \sigma_2^2$ v/s $H_1: \sigma_1^2 \neq \sigma_2^2$ b) $H_0: \mu_1 = \mu_2$ v/s $H_1: \mu_1 > \mu_2$
c) $H_0: P_1 = P_2$ v/s $H_1: P_1 \neq P_2$ d) $H_0: \rho_1 = \rho_2$ v/s $H_1: \rho_1 \neq \rho_2$
34. The value of test statistics for testing $H_0: \mu = 10$ v/s $H_1: \mu = 12$, based on a sample of size 100 with mean 12 and population variance (σ^2) 400 is-----.
- a) 1 b) 0.5 c) -1 d) -0.5
35. Which of the following is a simple hypothesis?
- a) $H_0: \lambda < 10$ b) $H_0: \lambda > 10$ c) $H_0: \lambda \neq 10$ d) $H_0: \lambda = 10$
36. In testing $H_0: \mu = 0$ against $H_1: \mu > 0$, null hypothesis ishypothesis
- a) simple b) composite c) neither null or composite iv) none of these
37. If 'r' is a sample correlation coefficient and 'ρ' is population correlation coefficient then Fisher's Z- transformation gives.....
- a) $Z = \frac{1}{2} \log \frac{1+r}{1-r}$ b) $Z = \log \frac{1+r}{1-r}$ c) $Z = \frac{1}{2} \log \frac{1-r}{1+r}$ d) $Z = \log \frac{1-r}{1+r}$
38. Which of the following is a composite hypothesis?
- a) $H: \lambda = 10$ b) $H: \lambda = 0$
c) $H: \lambda \neq 10$ d) $H: \lambda = k$, where k is known

Testing of Hypothesis-II

39. For testing goodness of fit,test is used.
- a) Normal b) t c) F d) Chi-Square
40. F- test is useful to test the
- a) equality of two population variances

- b) equality of two population proportions
 c) equality of correlation coefficients
 d) equality of two means
41. The degrees of freedom of Chi-square test statistics for testing independence of attributes in 2×2 Contingency table is
- a) 3 b) 1 c) 4 d) 2
42. Consider the following statements:
 Statement I: *F-test is used for testing equality of population means.*
 Statement II: *A χ^2 -test is used for testing independence of attributes.*
- a) Only (I) is correct b) Only (II) is correct
 c) Both (I) and (II) are incorrect d) Both (I) and (II) are correct
43. The degrees of freedom of Chi-square test statistic for testing independence of attributes in case of 5×4 contingency table are -----.
- a) 20 b) 9 c) 12 d) 15
44. Paired t-test is used for testing equality of two population -----.
- a) means b) variances c) proportions d) Correlation coefficients
45. Which of the following test can be used for testing $H_0: \sigma_1^2 = \sigma_2^2$ against $H_1: \sigma_1^2 > \sigma_2^2$?
- a) paired t-test b) chi-square test c) F-test d) Normal test
46. The degrees of freedom (d. f.) for testing $H_0: \mu = 0$ against $H_1: \mu > 0$ (σ is unknown) based on 12 observations are -----.
- a) 12 b) 11 c) 10 d) none of these
47. Which of the following test is used for testing the difference between populations means, based on two dependent samples?
- a) unpaired t-test b) paired t-test c) chi-square test d) F-test
48. For testing $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 > \sigma_0^2$ (when μ is unknown) based on 15 observations, degrees of freedom of chi-square test statistics are -----.
- a) 15 b) 12 c) 13 d) 14
49. For testing $H_0: \sigma^2 = \sigma_0^2$ against $H_1: \sigma^2 > \sigma_0^2$ (when μ is known) based on 15 observations, degrees of freedom of chi-square test statistics are -----.
- a) 15 b) 12 c) 13 d) 14
50. For testing $H_0: \sigma_1^2 = \sigma_2^2$ against $H_1: \sigma_1^2 > \sigma_2^2$, based on two samples of sizes 12 and 10, degrees of freedom of F-statistic are -----.
- a) 12, 10 b) 11, 9 c) 12, 9 d) 11, 10

Long Answer Questions (10 marks)

1. What is Time Series? Discuss the four components of time series.
2. What is secular trend? Describe the method of moving averages.
3. Explain fitting linear trend by the method of least squares.
4. Explain the construction of mean charts when
 - i) Standards are given
 - ii) Standards are not given.

5. Explain the construction of control chart for fraction defectives (p-chart) when standards are unknown.

6. Explain the construction of control chart for number of defects (c-chart) when standards are unknown.

7. Define the following terms:

- (i) Null hypothesis
- (ii) Alternative hypothesis,
- (iii) Critical region
- (iv) level of significance
- (v) power of the test

8. Describe small sample test for testing:

- i) $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$
- ii) $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$

9. Describe a test procedure for testing

- i) $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$
 - ii) $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$
- based on large samples.

10. Describe large sample test procedure for testing

- i) $H_0 : \rho = \rho_0$ against $H_1 : \rho \neq \rho_0$
 - ii) $H_0 : \rho_1 = \rho_2$ against $H_1 : \rho_1 \neq \rho_2$
- based on fisher's Z-transformation.

11. Describe small sample test procedure for testing

- i) $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 > \sigma_0^2$, when population mean (μ) is unknown
- ii) $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 > \sigma_2^2$

12. Explain the chi-square test for testing independence of attributes in case of m x n contingency table.

13. Describe large sample test procedure for testing

- i) $H_0 : P = P_0$ against $H_1 : P \neq P_0$
- ii) $H_0 : P_1 = P_2$ against $H_1 : P_1 \neq P_2$

14. For 2 x 2 contingency table,

a	b
c	d

Prove that chi-square test for independence of attributes gives

$$\chi^2 = \frac{N(ad-bc)^2}{(a+b)(a+c)(b+d)(c+d)}$$

where $N = a + b + c + d$

15. Define the terms:

- i) Type-I error
- ii) Type-II error
- iii) simple hypothesis
- iv) Composite hypothesis
- v) two-tailed tests

Short Answer Questions (5 marks)

1. What is time series? State its uses.
2. Describe method of progressive averages for determining trend.
3. Write a note on “Seasonal variations”.
4. Write a note on “Cyclical variations”.
5. Write a note on “Secular Trend”.
6. Write a note on “irregular variations”.
7. Distinguish between chance and assignable causes of variation.
8. Distinguish between process and product control.
9. Explain the construction of c-chart.
10. Explain lack of control situations.
11. Explain the construction of R-chart.
12. Write a note on Yates’ correction for continuity in case of 2 x 2 contingency table.
13. What is Shewhart’s control chart? Explain its construction.
14. Explain simple hypothesis and composite hypothesis with suitable examples.
15. Describe large sample test for testing $H_0 : P_1 = P_2$ against $H_1 : P_1 \neq P_2$.
16. Explain paired t-test for testing difference of means.
17. Write a note on F-Test for equality of population variances.
18. Explain the terms: i) Type-I error ii) Type-II error.
19. Describe the large test procedure for testing $H_0 : P = P_0$ against $H_1 : P \neq P_0$.
20. Describe the large test procedure for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$.
21. Describe the large test procedure for testing i) $H_0 : \rho = \rho_0$ against $H_1 : \rho \neq \rho_0$ where ρ is the population correlation coefficient.
22. Write a note on “Goodness of fit test”.
23. Describe a chi-square test for testing $H_0 : \sigma^2 = \sigma_0^2$ against $H_1 : \sigma^2 > \sigma_0^2$, when population mean (μ) is unknown.
24. Explain the terms with suitable example: a) Simple hypothesis b) Composite hypothesis
25. Describe large sample test for testing $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$.
26. Distinguish between seasonal and cyclical variations.
27. Describe large sample test for testing $H_0 : \rho_1 = \rho_2$ against $H_1 : \rho_1 \neq \rho_2$.
28. Describe the small test procedure for testing $H_0 : \mu = \mu_0$ against $H_1 : \mu \neq \mu_0$.
29. Describe the sample test for testing $H_0 : \mu_1 = \mu_2$ against $H_1 : \mu_1 \neq \mu_2$.
30. Explain the terms ‘statistics’ and ‘sampling distribution of statistic’ with suitable example.