Yashavantrao Chavan Institute of Science, Satara.

Department of Statistics

Continuous Probability Distribution –II (BST-401)

Subject Code :-14004

<u>Question Bank</u>

Q.1) Define following Term/Answer in one sentence. (2-Marks)

1) Define the p.d.f. of Gamma distribution and it's mean.
2) Find the constant k such that the given functions are p.d.f.

$$f(x) = \begin{cases} kx\ (1-x)\ ; 0 < x < 1 \\ \quad 0 \qquad ; ow \end{cases}$$

3) Define Normal distribution and draw graph of Normal distribution.
4) Write m.g.f. of Chi-square distribution.
5) Define the p.d.f. of chi-square distribution with n- degree of freedom.
6) Derive marginal distribution of Bivariate Normal distribution.
7) Write mean and variance of Chi-square distribution.
8) Write mean and variance of t- distribution.
9) Define the p.d.f. of Beta distribution of first kind and it's mean.
10) Define mean of Gamma distribution with parameters 'n' and 'θ'.
11) Define Normal distribution and draw graph of Normal distribution.
12) Define F-distribution with (n_1, n_2) degree of freedom.
13) Verified p.d.f. of Gamma distribution.
14) Verified p.d.f. of Beta I kind distribution.
15) Define Bivariate Normal distribution.
16) Write m.g.f. of Normal distribution.
17) Define the p.d.f. of Gamma distribution and it's mean with parameters 'n' and 'θ'.
18) Define mode of Normal distribution.
19) Write mean and variance of Gamma distribution.
20) Write mean and variance of Normal distribution.
21) Define marginal distribution of Bivariate Normal distribution.

22) Define mean and variance of marginal distribution of Bivariate Normal distribution.

23) Verified p.d.f. of Normal distribution.

24) Write mean and variance of Beta I kind distribution.

25) Write mean and variance of Beta II kind distribution.

26) Define mean and variance of conditional distribution of X given Y of Bivariate Normal distribution.

27) Define mean and variance of conditional distribution of Y given X of Bivariate Normal distribution.

28) Verified p.d.f. of Beta II kind distribution.

29) Write mean and variance of F- distribution.

30) Write m.g.f. of Gamma distribution.

Q. 2) Attempt any two of the following: (10 marks)

1. Define chi-square variate with n d. f. and derive its p. d. f. using m. g. f.

2. Let **X** $\sim G(\alpha, \lambda_1)$ and **X** $\sim G(\alpha, \lambda_2)$. If X and Y are independent show that

$$\frac{X}{1\text{-}X} \rightarrow \beta(\lambda_1,\lambda_2)$$

Note: Gamma distribution also defined with parameters ‘θ’ and ‘n’ i.e. X $\sim G(\theta, n)$

3. Define t variate with n d. f. Also find its mean and variance.

4. Let **X** $\sim G(\alpha, \lambda_1)$ and **X** $\sim G(\alpha, \lambda_2)$. If X and Y are independent r. v. s Find probability distribution

$$\frac{X}{X+Y}$$

5. Define t variate with n d. f. and derive its p. d. f.

6. Obtain m. g. f. of chi-square variate with n d. f. and hence find its mean and variance.

7. Define Gamma distribution with two parameters. Obtain its mean, variance and mode.

8. Define beta distribution of first kind and beta distribution of second kind. State and prove relation between them.
9. Define F-distribution with (n_1, n_2) d. f. and derive its p. d. f. .
10. Define Gamma distribution, find its m. g. f. and hence or otherwise find its mean and variance.
11. Define beta distribution of first kind. Find its mean, variance and H. M.
12. Define chi-square variant with n d. f. Derive its distribution using m. g. f.
13. Let **X** $\sim N(\mu, \sigma^2)$, Obtain its mean, median and mode state their relation.
14. If $F \sim F(n_1, n_2)$ then find the probability distribution of n_1F as $n_2 \to \infty$.
15. Define Gamma distribution with two parameters and find its find its β_1 coefficient.
16. Let X and Y are two independent Gamma variates with parameters μ and ν respectively. Obtain and identify distribution of X + Y and $\frac{X}{X+Y}$.
17. Define chi-square variate with n d. f. Obtain iys mean and variance..
18. Define normal distribution with parameters μ, σ^2 . Also Show that (2r)th central moment of the distribution is given by $\mu_{2r} = \sigma^{2(2r-1)} \mu_{2r-2}$
19. Define Gamma distribution with two parameters α and λ.Obtain distribution of $\frac{X}{X+Y}$, where X and Y are independent Gamma variates with parameters λ_1 and λ_2 respectively.
20. Obtain p. d. f. of Chi square distribution with n d. f.
21. Define normal distribution with parameters μ and σ^2. Let $X \sim N(\mu_1, \sigma_1^2)$ and Y~ $N(\mu_2, \sigma_2^2)$ and X and Y are independent. Obtain distribution of $aX^2 + bX + c$ where a, b, c are constants.
22. Define F variate with n1 and n2 d. f. and derive its p. d. f. Find mean, median and mode of normal distribution.
23. Define bivariate distribution and find its marginal distribution.

24. Define bivariate distribution and find its conditional distribution of X given Y distribution.

25. Define bivariate distribution and find its conditional distribution of Y given X distribution.

Q. 3 Attempt any four of the following: (5 Marks)

1. If $X \sim \beta_1(m, n)$ then find probability distribution of 1-X.
2. Find harmonic mean of beta distribution of second kind.
3. If **X** $\sim G(\alpha, \lambda)$ then find its cumulants.
4. Obtain probability distribution of $-\frac{1}{\theta}\log X$ when **X** $\rightarrow U(0, 1)$.
5. State and prove additive property of chi-square variates.
6. Find mode of beta distribution of first kind.
7. Find H. M. of beta distribution of second kind.
8. Find H. M. of beta distribution of first kind.
9. State and prove additive property of Chi-square variates,
10. If **X** $\sim t_n$, find probability distribution of X^2..
11. A continuous r. v. X has p. d. f.
12. Find mode of beta distribution of second kind

    $f(x)=ke^{-\frac{1}{18}(x^2-12x+36)}, \quad -\infty<x<\infty, k>0$

    Find k. State mean and variance of X.
13. Let $\mathbf{X_i} \sim N(0, 1)$, i= 1, 2, 3, 4. Assuming independence obtain F variate with 2, 2, d. f.
14. If $X \sim \beta_1(m, n)$, obtain probability distribution of $Y = \frac{X}{1-X}$
15. Define t-distribution with n d. f. . Obtain its mean.
16. If $F \sim F(n_1, n_2)$, then find distribution of 1/F.
17. State any five properties of a normal distribution with parameters μ and σ_2 .

18. Find mean, variance of beta distribution of second kind.

19. Find mean, variance of beta distribution of first kind.

20. Find mean, variance of t distribution with n d. f. .

21. If F~ F(n_1, n_2), then find the probability distribution n_1F as $n2\to\infty$,

22. If t follows t-distribution with n d. f. Obtain the distribution of $X = t_2/n$.

23. Define F-distribution with (n_1, n_2) d. f. and find its mean..

24. Define t-distribution with n d. f. and find its mode.

25. Find median of normal distribution with parametersμ, σ^2.

26. Let X~β_1(m, n) Obtain distribution of 1-X,

27. State and prove additive property of chi-distribution.

28. Define beta distribution of first and second kind. State relation between them.

29. State and prove additive property of normal distribution.

30. State and prove relation between t and F distributions.

31. Find mode of F-distribution with n1 and n2 d. f.'s

32. State and prove additive property of chi-square variate.

33. Find variance of t distribution with n d. f. .

34. Let Xi ~N(0,1) i=1, 2, 3, 4. Assuming independence construct t variate with 3 d. f. .

35. Write mean and variance of condition distribution of (X/Y=y) and (Y/X=x) of Bivariate Normal distribution.

36. Let (X,Y) follows Bivariate Normal distribution. If X and Y are independent variable then prove that $\rho = 0$.

37. Derive condition distribution of (Y/X=x) of Bivariate Normal distribution.

38. Determine the parameters of Bivariate Normal distribution

$$f(x,y) = c.\exp\left\{-\frac{[16(x-2)^2 - 12(x-2)(y+3) + 9(y+3)^2]}{216}\right\}$$

B. Sc. II General Science Semester IV Examination,
STATISTICS
Statistical Methods – II (BST 402)
Question Bank

Q.1. Answer the following [2 marks]

1. What is the statement of chebychev's Inequality?
2. Let ϴ denotes mean and standard deviation of random variable X. What is the lower bound for $P(-3\Theta < X < 5\Theta)$.
3. What is the difference between parameter and statistic?
4. What is the critical region?
5. If μ and σ are process mean and S.D. then shewart suggested the control limits is…
6. Define Null Hypothesis
7. Define alternative hypothesis
8. Define a simple hypothesis.
9. Define composite hypothesis.
10. What is the level of significance?
11. What is the type I error?
12. What is the type II error?
13. Define p value.
14. What is the purpose of Chi-Square test?
15. What are assumptions of the t test?
16. What are the assumptions of paired t test?
17. What is test statistics to test equality of two proportions?
18. What is one tailed test and two tailed test?
19. What is the purpose of the F test?
20. What is the chance cause and assignable cause?
21. What is difference between parameter and statistic?
22. Define the term estimate and estimator.

23.What is the power of the test?

24.What is central limit theorem?

Q.2 Answer the following **[5 Marks]**

1. State and prove Chebychev's inequality for discrete distributions.
2. A fair die is tossed 720 times, use Chebychev's inequality to find lower bound for probability of getting 100 to 140 sixes.
3. Explain the procedure of testing of hypothesis.
4. The sample mean of 100 observations is 30 whose S.D. is 20. Test whether the sample has been come from a population with mean 29.
5. Distinguish between chance and assignable causes of variation.
6. Explain the Chi-square test of goodness of fit.
7. What is difference between large sample test and small sample tests.
8. How to test hypothesis Ho: $\mu = \mu o$ v/s H1: $\mu \neq \mu o$ when n is large.
9. A sample of 400 items is taken from a population whose standard deviation is 20. The mean of the sample is 30. Test whether the sample has been come from a population with mean 29.
10. Describe the test procedure to test Ho: $\mu 1 = \mu 2$ v/s H1: $\mu 1 \neq \mu 2$ for large samples.
11. Explain the procedure of testing of hypothesis.
12. A sample of 400 observations has mean 95 and s.d.12. Could it be a random sample from a population with mean 98?
13. Test the significance of the difference between the means of the sample from the following data:

Sample	Size of sample	Mean	S.D.
A	144	61	8
B	144	63	6

14. How to test the hypothesis Ho: P = Po v/s H1: P ≠ P0?
15. How to test the hypothesis Ho: P = Po v/s H1: P < P0?
16. A dice is thrown 900 times and a throw of 3 or 4 is observed 3,24 times. Show that the dice cannot be regarded as an unbiased one.

17. Explain the role of fisher z transformation to test Ho: ρ = ρo .

18. Suppose 20 observation drawn from normal distribution how to test hypothesis Ho: $\mu = \mu o$ against H1: $\mu \neq \mu o$

19. How to construct control chart for number of defects.

20. Suppose n observation drawn from normal distribution with known mean how to test hypothesis Ho: $\sigma^2 = \sigma o^2$

21. Explain the test procedure for independence of attribute in case of 2 x 2 contingency table.

22. Explain the yate's correction for continuity.

23. How to test equality of two variance when both the samples are drawn from normal distribution.

24. Explain the procedure to construct range chart (R-chart).

25. Explain the procedure to construct mean chart.

26. How to construct control chart for fraction defective p – chart

27. How to construct control chart for number of defectives or np – chart

28. In a large consignment of orange a random sample of 64 oranges revealed that 14 oranges were bad. Is it reasonable to assume that 20% oranges were bad?

29. In sample of 100 persons, there are 60 males and 30 persons had an attack of cholera. If 12 females are found to be attacked by cholera can you say that sex and attack of cholera are independent.

30. 10 individuals are chosen at random from a normal population and their heights are found to be 63,66,67,68,69,70,70,71,71,65 inches Test weather the sample belongs to the population whose mean height is 66?

Q.3 Answer the following **[10 Marks]**

1. Suppose n observation drawn from normal distribution, how to test hypothesis Ho: $\sigma^2 = \sigma o^2$ variance in case of i) μ is known ii) μ is unknown.
2. Explain the test procedure for independence of attribute in case of r x s contingency table.

3. Explain the construction of control chart for number of defectives when standards are not given.
4. Let X1 and X2 be two independent observations taken from a normal population with mean μ S.D. σ. It is desired to test the null hypothesis Ho : $\mu = 0$ against alternative hypothesis H1 : $\mu \neq 0$ at 1 % l.O.S. Show that, null hypothesis, Ho will be rejected if $|x1 + x2| \geq |x1 - x2| \tan(89^{o},6')$.
5. State and prove chebychev's inequality.
6. Explain any two-test procedure based on chi-square distribution.
7. Suppose n1 and n2 observation drawn from two normal distribution how to test hypothesis Ho: $\mu1 = \mu2$ against H1: $\mu1 \neq \mu2$
8. Explain the paired t – test
9. Explain difference between variable control charts and attributes control charts also explain the procedure to construct control charts for number of defects
10. Describe the procedure for testing Ho: $\mu1 = \mu2$ based on normal distribution.