

E 8610

(Pages : 3)

Reg. No.....

Name.....

B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2019

Third Semester

Complementary Course—ADVANCED STATISTICAL METHODS

(2013—2016 Admissions)

Time : Three Hours

Maximum : 80 Marks

Part A (Short Answer Questions)

Answer all questions.

Each question carries 1 mark.

1. What is the mean and variance of Poisson distribution with parameter λ ?
2. Comment on the statement "The mean of a binomial distribution is 3 and variance is 4".
3. What is the moment generating function of normal distribution $N(\mu, \sigma^2)$.
4. What is a sampling distribution ?
5. A random sample of size 10 is taken from a normal population with mean 5 and SD 2. Write down the distribution of its mean.
6. What is the length of the 95 % confidence interval for the population mean of a normal population with σ known.
7. What is the confidence interval for the variance of a normal population ?
8. What is composite hypothesis ?
9. If X follows $N(0, 1)$, what is the distribution of X^2 ?
10. Define critical region.

(10 × 1 = 10)

Part B (Brief Answer Questions)

Answer any eight questions.

Each question carries 2 marks.

11. Given the mgf of a binomial variable as $M_X(t) = \left(\frac{1}{3}\right)^5 (2 + c^t)^5$. Obtain the mean and variance of X .
12. If X follows Poisson distribution such that $P(X \leq 1) = P(X = 2)$. Find $P(X = 0)$.
13. If the p.d.f. of X is $f(x) = ke^{-\frac{1}{60}(x^2 - 10x + 25)}$, $-\infty < x < \infty$ find k and the mean and standard of X .
14. Distinguish between parameter and statistic.
15. Define Chi-square statistic. What are the applications of Chi-square distribution ?

Turn over

16. Write down the pdf of Student's t distribution. What are the characteristics of t distribution ?
17. Distinguish between point estimation and interval estimation.
18. Illustrate by an example that a consistent estimator need not be unbiased.
19. From a lot containing unknown proportion p of defectives, a random sample of 50 items were taken. If the sample contains 6 defectives, obtain an estimate of the SE of your estimate.
20. Distinguish between large sample and small sample tests.
21. Define (i) Power ; (ii) Significance level.
22. Explain Neyman-Pearson approach for testing a statistical hypothesis.

(8 × 2 = 16)

Part C (Descriptive or Short Essays)

Answer any six questions.

Each question carries 4 marks.

23. A random variable X is normally distributed with mean 12 and S.D. 4. Find the probability of the following (i) $X \geq 20$; (ii) $X < 20$; (iii) $0 \leq X \leq 12$.
24. In a Poisson frequency distribution frequency corresponding to 3 successes is $\frac{2}{3}$ times frequency corresponding to 4 successes. Find the mean and standard deviation of the distribution.
25. Define F-Statistic. Write its pdf. What are the applications of F distribution ?
26. Derive the sampling distribution of mean of samples from a normal population.
27. Derive the 99 % confidence interval for the mean (where σ known) of a normal population $N(\mu, \sigma^2)$.
28. A random sample of size 15 from a normal population gives $\bar{X} = 3.2$ and $S^2 = 4.24$. Determine the 90 % confidence limits for σ^2 .
29. Explain Neyman-Pearson approach for testing of hypothesis.
30. How will you test the equality of the means of 2 normal populations when the population variances are identical but known ?
31. Before an increase in excise duty on tea 800 persons out of a sample of 1000 persons were found to be tea drinkers. After an increase in duty 800 people were tea drinkers in a sample of 1200 people. Test whether there is significant decrease in the consumption of tea after the increase in duty.

(6 × 4 = 24)

Part D (Essays)

Answer any two questions.

Each question carries 15 marks.

32. Seven coins are tossed and the number of heads noted. The experiment is repeated 128 times and the following distribution is obtained :

No. of heads :	0	1	2	3	4	5	6	7
Frequencies :	7	6	19	35	30	23	7	1

Fit a binomial distribution assuming :

- (i) The coin is unbiased.
- (ii) The nature of the coin is not known.

Also find the expected frequencies.

- 33. Explain the inter-relationships between normal, standard normal, Chi-square Student's t and F distributions.
- 34. Explain the properties of a good estimator. Examine how far these properties are satisfied by the sample mean \bar{X} from a normal population.
- 35. Explain Chi-square test of independence of attributes. Derive the formula for a 2×2 table.
(2 × 15 = 30)