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B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2018

Third Semester

Complementary Course—ADVANCED STATISTICAL METHODS

(2013—2016 Admissions)

Time : Three Hours

Maximum Marks : 80

Part A (Short Answer Questions)

*Answer all ten questions.
Each question carries 1 mark.*

1. If $X \sim B(n, p)$, what are its mean and variance ?
2. Define a Poisson distribution.
3. Give the formula for the moment generating function of $X \sim P(3)$.
4. What are the values of mean and S.D. for a standard normal random variable ?
5. Define a Statistic.
6. Define Standard Error.
7. What is the relation between a Standard Normal and Chi-square random variables ?
8. Define consistency.
9. Define a simple hypothesis.
10. What is meant by 'p' value ?

(10 × 1 = 10)

Part B (Brief Answer Questions)

*Answer any eight questions.
Each question carries 2 marks.*

11. The mean of a binomial distribution is 4 and variance is 3. Find the first term, last term and the middle term or terms.
12. Derive the moment generating function of Poisson distribution.
13. Show that a binomial distribution tends to a Poisson distribution (under conditions to be stated).
14. If $X \sim N(10, 100)$, find the probability that X lies between 15 and 25.

Turn over

- 15. Define a Chi-square random variable. Give an example of a Chi-square variable.
- 16. Give an example of a statistic following F-distribution ?
- 17. Distinguish between point estimation and interval estimation.
- 18. Define unbiasedness and consistency of estimators.
- 19. Distinguish between type I and II errors.
- 20. Differentiate between large sample and small sample tests.
- 21. Give the test statistic for a Chi-square test of goodness of fit.
- 22. Differentiate between simple and composite hypothesis.

Part C (Descriptive or Short Essays)

(8 × 2 = 16)

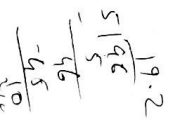
Answer any six questions.

Each question carries 4 marks.

- 23. Obtain the moment generating function of a standard normal distribution.
- 24. For a normal distribution with mean = 30, variance = 8, find the score below which there are 20 % observations.
- 25. Establish the additive property of Poissons Variables.
- 26. State important properties of normal distribution.
- 27. Bring out the inter-relationship between normal, χ^2 Chi-square and F-variables.
- 28. In two colleges affiliated to a university 46 out of 200 and 48 out of 250 candidates failed in an examination. If the percentage of failure in the University is 18 %, examine Whether the Colleges differ significantly.
- 29. Two sample taken from normal populations gave the following results :—

Sample size	Mean	S.D.
12	1050	68
10	980	74

Do the samples come from the sample population given $\sigma_1^2 = \sigma_2^2$.



- 30. Explain a paired t test.
- 31. A die is thrown 600 times and the frequencies of the occurrence of face numbers 1, 2, 3, 4, 5 and 6 are 92, 87, 90, 110, 113, 108 respectively. In the light of this data, examine whether the die is unbiased.

(6 × 4 = 24)

Part D (Essays)

Answer any two questions.

Each question carries 15 marks.

- 32. Fit a Poisson distribution to the following data and test for its goodness of fit :—
- | x | 0 | 1 | 2 | 3 | 4 |
|-----|-------|------|-----|---|---|
| f | 17167 | 1861 | 124 | 2 | 1 |
- 33. For a normal distribution 15 % of the observations are below 38 and 68 % are below 79. Find the mean and standard deviation of the distribution.
 - 34. Explain Chi-square test of independence of two attributes. State the formula for a 2×2 table.
 - 35. What is meant by confidence interval ? Derive $(1 - \alpha)$ 100 % confidence interval for population mean of a normal distribution when (i) Mean is known ; and (ii) Mean is unknown.

(2 × 15 = 30)

