MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :………………… **Name :…………………**

Third Semester B.Sc. Degree Examination, November 2016
First Degree Programme under CBCSS
Complementary Course: Statistics – III (for Mathematics)
AUST331.2c: Probability Distributions and Theory of Estimation

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions / problems in one or two sentences.*

1. If X~B (8, 1/3), then what is the distribution of 8 – X ?
2. Give the expression for the even ordered central moments of a normal distribution.
3. What is distribution of ratio of two independent Gamma variables ?
4. If X~ N(0,1),then what is the distribution of X^2 ?
5. Define weak law of large numbers.
6. Find the quartile deviation of normal distribution.
7. Point out the relationship between t and F statistic.
8. Name the discrete distribution for which mean and variance has the same value.
9. Distinguish between estimate and estimator.
10. Define Fisher's t statistic.

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions / problems, not exceeding a paragraph.*

11. Identify the distribution if m.g.f of the distribution is $M_X(t) = \frac{(1+e^t)^5}{32}$.
12. Show that under certain conditions (to be noted) Binomial distribution tends to Poisson distribution.

13. Explain lack of memory property of a Geometric distribution.
14. Derive m.g.f of an Exponential distribution with parameter θ.
15. List out basic assumptions in Lindberg – Levy form of Central limit theorem.
16. Distinguish between distribution parameter and population parameter.
17. Give the relationship between β_1 and β_2 distribution.
18. What are the points of inflexion of a normal curve N (μ,σ^2) ?
19. Define suffiency and give an example to it.
20. Define Likelihood function.
21. Let $X_1, X_2, \ldots. X_n$ be a random sample from $U(0,\theta)$,then what is m.l.e of θ ?
22. A symmetric die is thrown 600 times. Find the lower bound for probability of getting 80 to 120 sixes.

(8 × 2 = 16 Marks)

SECTION – C

Short essay type problems : Answer any ***SIX*** *questions.*

23. If Xi can have only two values i^{α} and $i^{-\alpha}$ with equal probability. Show that the law of large numbers can be applied to the independent variables $X_1, X_2, \ldots.$ if $\alpha<1/2$.
24. If X and Y are independent Poisson variates such that P(X=1) = P(X=2) and P(Y=2) = P(Y=3).Find the variance of X – 2Y.
25. Derive mean and variance of hype geometric distribution.
26. X is a normal variate with mean 30 and s.d 5,find the probability that
    a) $26\le X\le 40$,
    b) $X\ge 45$ and
    c) $|X-30|>5$.
27. Define unbiasedness and consistency.give an example which is
    a) Unbiased but not consistent.
    b) Consistent but not unbiased.
28. A random sample $X_1, X_2, \ldots. X_n$ is taken from a normal population with mean zero, variance σ^2.Examine if $\dfrac{\sum_{i=1}^{n} X_i^2}{n}$ is m.v.u.e.of σ^2

29. Obtain $100(1-\alpha)\%$ confidence interval for the parameter σ^2 of the Normal distribution $N(\mu,\sigma^2)$.
30. State and prove the additive property of χ^2 distribution.
31. Obtain the distribution of the sample mean of a random sample $X_1, X_2, \ldots X_n$ of size n from $N(\mu,\sigma^2)$.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type problems : Answer any **TWO** questions.*

32. a) Derive the m.g.f $X\sim N(\mu,\sigma^2)$.
    b) How a normal distribution is connected to chi – square distribution ?
33. Derive the recurrence relation of central moments of Binomial distribution. Hence find its first three central moments.
34. a) Two unbiased dice are thrown. If X is the sum of the numbers showing up, prove that $P(|X-7|\geq 3)\leq 35/54$. Compare this with actual probability.
    b) Establish the relationship between t,F and χ^2.
35. Let $X_1, X_2, \ldots X_n$ be random sample of size n from $N(\mu,\sigma^2)$. Find m l e's of μ and σ^2 and examine whether they are unbiased and consistent.

(2 × 15 = 30 Marks)

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