MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :………………… **Name :…………………**

Third Semester B.Sc. Degree Examination, November 2015
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. Write down the distribution function of Uniform distribution.
2. Find the m.g.f of the Binomial distribution with $n = 16$ and $p = 0.6$.
3. Show that the sample mean is an unbiased estimate of the population mean.
4. Distinguish between parameter and statistic.
5. What is the relation between the mean and standard deviation of an exponential distribution ?
6. Write the distribution of $X + Y$ if X and Y are two independent Gamma variates with parameters n_1 and n_2.
7. State Tchebycheff's inequality.
8. Find the mean of a Poisson distribution for which P(X = 1) = P(X = 2).
9. What is the 4^{th} central moment of N(10,3) ?
10. Under what conditions the Binomial distribution will tend to the Poisson distribution ?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. Find the moment generating function of Uniform distribution in the interval (0, 1).
12. Show that for a Poisson distribution, the coefficient of variation is the reciprocal of the standard deviation.
13. If the moment generating function of a distribution is $\left(\frac{1}{3}+\frac{2}{3}e^{t}\right)^{12}$, find the mean and variance of the distribution.
14. State the relation between Student's t, chi – square and F distributions.
15. Find the m.g.f of the Geometric distribution with parameter p and hence find its mean and variance.
16. What are the desirable properties possessed by M.L estimates ?
17. Find the harmonic mean of Beta distribution of the first kind with parameters p and q.
18. Explain the concept of consistency.
19. If X_1 and X_2 are independent random variables with $f(x) = e^{-x}$, $x > 0$, find the distribution of $Y = X_1 + X_2$.
20. If X follows N(25,6), find the points of inflexion of the Normal distribution.
21. Find a lower limit for the variance of any unbiased estimator of θ, where $f(x; \theta) = \theta e^{-\theta x}; x > 0$.
22. Define Hyper – Geometric distribution and find its mean.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Find the mean deviation about mean of the Uniform distribution over the interval (a,b).
24. State and prove the lack of memory property of Geometric distribution.
25. A random sample of size 11 from a normal population is found to have variance 12.3. Find a 95% confidence interval for the population variance.
26. State and prove the additive property of Binomial distribution.

27. For the Exponential distribution $f(x) = \frac{1}{\sigma} e^{-\frac{x}{\sigma}}$; $0 \leq x < \infty$; $\sigma > 0$, find μ_r' and hence find mean, standard deviation, β_1 and β_2.
28. A random sample X is normally distributed with mean 12 and S.D 2. Find the probability of the events i). $8 \leq X \leq 14$ and ii). $|X - 12| > 3$.
29. What are the main features of Normal distribution with mean μ and variance σ^2 ?
30. Obtain the sampling distribution of the mean of samples from a normal population.
31. Show that a linear combination of a set of independently and normally distributed random variables is normally distributed.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Fit a Poisson distribution to the following data.

X	0	1	2	3	4	5	6	7	8	9	10
f	103	143	98	42	8	4	2	0	0	0	0

(15 Marks)

33. Derive the mean deviation about mean (M.D.) and quartile deviation (Q.D.) of a Normal distribution and show that Q.D:M.D:S.D = 10:12:15. **(15 Marks)**
34. i). State and prove the weak law of large numbers. **(6 Marks)**

    ii). If X_i is a random variable which assumes values i and – i with equal probabilities, show that the law of large numbers cannot be applied to the sequence $X_1, X_2, \ldots, X_n$. **(9 Marks)**
35. i). Explain the concept of interval estimation. **(7 Marks)**

    ii). Obtain the interval estimate of the mean of a normal population with confidence coefficient α when (a). variance σ^2 is known (b). σ^2 is unknown.

(8 Marks)

(2 × 15 = 30 Marks)

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