SAIVA BHANU KSHATRIYA COLLEGE

(Aruppukottai Nadargal Uravinmurai Pothu Abi Viruthi Trustuku Pathiyapattathu)

ARUPPUKOTTAI

QUESTION BANK

Name of the Department :	MATHEMATICS	UG / PG :	PG
Semester:	III	Subject Code :	EMTPC32
Name of the Subject :	PROBABILITY THEORY		

Section A (2 marks Questions)

Unit I: (Random events & Random variables)

1. Define: Non decreasing sequence
2. Define: Independent of random variable
3. Define: Distribution function
4. Define: probability function
5. Define: continuity interval

Unit II: (Parameters of the distribution of a random variable)

6. Define: Expected value of the random variable g(X)
7. Define: Central moment.
8. Define: Variance
9. Define: Coefficient of skewness
10. Define : Second order moment

Unit III: (Characteristics Functions)

11. Define: Characteristics function
12. Define: Semi invariant
13. Define: Characteristics function of multi dimensional random vector
14. Define: Probability generating function
15. State Cramer-Wold theorem

Unit IV: (Some probability distributions)

16. Define: One point distribution
17. Write the characteristics function of generalized binomial distribution.
18. Write the variance of hyper geometric distribution
19. Write the mean value of binomial distribution
20. Define: Gamma distribution

Unit V: (Limit Theorems)

21. Define: Stochastically Convergent
22. Define: Limit distribution
23. State Lindeberg-Levy theorem
24. Write the structure of asymptotically normal distribution
25. State Levy- Cramer theorem

Section B (5 mark Questions)

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Unit I: (Random events & Random variables)

26. Let X and Y be the standard normal distribution. Find the density of Z=X+Y
27. Show that if (X,Y) is a random variable of the continuous type whose density function f (x,y) is everywhere continuous, for arbitrary points (x,y) is a necessary and sufficient condition for the independence of the random variable X and Y
28. State and prove Baye"s theorem.
29. Let X be random variable with distribution function F(x). Find density of $Y=X^2$
30. Explain the marginal distribution with example

Unit II: (Parameters of the distribution of a random variable)

31. Derive the residual Variance of regression of the second order.
32. The equality $\rho^2 = 1$ is a necessary and sufficient condition condition for the relation P(Y=aX+b)=1 to hold.
33. Derive the moments of the conditional distribution of one of the random variable X, Y under the condition that second takes on a certain given value
34. The expected value of the product of an arbitrary finite number of independent random variable, whose expected values exist, equals the product of the expected values of these variables.
35. Let X bee random variable with binomial distribution. Compute expected values of X

Unit III: (Characteristics Functions)

36. If the *lth* moment m_l *of a rando*m variable exists, it is expressed by formula $m_l = \emptyset^{(l)}(t)/\, i^{\,l}$,where is the *lth* derivatives of the characteristics function $\emptyset(t)$ of this random variable at $t=0$
37. Find the characteristics function and variance of Poisson distribution.
38. The characteristics function of the sum of an arbitrary finite number of independent random variable equals the product of their characteristics function.
39. If the random variable X is of the discrete type and can take on only integer values, Find the probability function from its characteristics function
40. The random variable X has binomial distribution compute the probability generating function of X

Unit IV: (Some probability distributions)

41. Find skewness of zero one distribution
42. Additional theorem for binomial distribution
43. Explain the Poisson scheme with example.
44. Compute variance of Polya distribution
45. The random variable X has the distribution N(1;2) . Find the probability that X is greater than 3 in absolute value.

Unit V: (Limit Theorems)

46. If the sequence $\{F_n(x)\}$ (n=1,2,…) of distribution functions is convergent to the distribution function F(x), then the corresponding sequence of characteristics functions $\{\emptyset_n(t)\}$ coverages at every point t to the function $\emptyset(t)$ which is the characteristics function of the limit distribution function F(x) and the convergence to $\emptyset(t)$ is uniform with respect to t in every finite interval on the t-axis
47. Explain stochastically Convergent with example
48. Let $F_n(x)$ (n=1,2,…) be the distribution function of the random variable X_n. The sequence $\{X_n\}$ is stochastically Convergent to 0 if and only if the sequence $\{F_n(x)\}$ satisfies the relation $\lim x \to \infty\ F_n(x) = 0$, for $x \leq 0$ and 1 , for $x>0$
49. The sequence of random variable $\{X_n\}$ given by $P(Y_n = \frac{r}{n}) p^r (1-p)^{n-r}$, wher $0<p<1$ and $X_n = Y_n - p$ is stochastically Convergent to 0, that is , for any $\varepsilon>0$ we have
$\lim x \to \infty\ P(|X_n| > \varepsilon)=0$
50. State and prove the Gnedenko theorem

Section C (10 mark Questions)

Unit I: (Random events & Random variables)

51. The single -valued function F(x) is a distribution function if and only if it is non decreasing, continuous at least from the left and satisfies condition $F(-\infty)=0$,$F(+\infty)=1$
52. Write a brief notes for conditional distribution with discrete and continue thpe

Unit II: (Parameters of the distribution of a random variable)

53. State and prove Lapunov inequality
54. State and prove Chebyshev's inequality

Unit III: (Characteristics Functions)

55. F(x) and (t) denote respectively the distribution function and the characteristics function of the random variable X. If a+h and a-h (h>0) are continuity of the distribution function F(x), $F(a+h)-F(a-h)= \lim_{T \to \infty} \frac{1}{\pi} \int_{-T}^{T} \frac{\sin ht}{t} e^{-ita}\ \emptyset(t)\, dt$
56. Derive the characteristics function of a linear transformation of the random variable X

Unit IV: (Some probability distributions)

57. Write brief notes of the random variable with uniform distribution.
58. Let X be a random variable with cauchy distribution. Find the characteristics

function of X

Unit V: (Limit theorems)

59. State and prove Lapunov theorem
60. State and prove Levy-Cramer theorem