

MAHATMA GANDHI UNIVERSITY, KOTTAYAM

MGU-UGP (HONOURS) SECOND SEMESTER EXAMINATION (2024 ADMISSION ONWARDS)

MODEL QUESTION PAPER - THEORY

STATISTICS

MG2DSCSTA100 – Introduction to Statistical Modelling

Duration: 1.5 Hours

Maximum: 50 Marks

Students should attempt at least one question from each course outcome to enhance their overall outcome attainability.

Part A

Short answer questions

Answer any seven questions. Each question carries 2 marks.

1. Mention any two examples for continuous random variable. [U] [1]
2. Given the pmf as $f(x) = \frac{x+2}{12}$; $x = 1, 2, 3$ and 0 elsewhere, find pmf of $y = 2x - 3$. [U] [1]
3. Define distribution function of a discrete random variable. [K] [1]
4. If it rains, a taxi driver can earn Rs 100 per day. If the climate is fair, he will lose Rs 40 per day. If the probability of raining is 0.4, what is his expected earning? [A] [2]
5. Define variance and harmonic mean in terms of expectation. [K] [2]
6. Given the pdf as $f(x) = 2x$; $0 < x < 1$ and 0 elsewhere, find $E(3X)$. [An] [2]
7. Define discrete uniform distribution. [K] [3]
8. Mention any two properties of exponential distribution. [U] [3]
9. If Z is a standard normal variable, find $P(Z > 1.8)$. [An] [3]
10. Mention a context where Bernoulli distribution can be applied. [A] [3]

Part B

Short Essay questions

Answer any four questions. Each question carries 6 marks.

11. In a factory, 28% of tune ups are done on 4 cylinders, 36% on 5 cylinders, 17% on 6 cylinders and 19% on 8 cylinders. Let X be the random variable denoting the number of cylinders undergoing tune ups. Find pmf of X. Also find $P(X > 4)$. [U] [1]
12. Define moment generating function and characteristic function of a random variable. Mention the properties of moment generating function. [K] [2]
13. A company forecasts the number of units of a product it will sell in a month as follows. Find the mean number of units sold and its variance in sales.

x	100	200	300
probability	0.4	0.3	0.3

[An] [2]

14. Mention the properties of mathematical expectation. [U] [2]
15. The incidence of occupational disease in an industry is such that the workers have a 20% chance of suffering from it. Five workers are chosen at random. Assuming binomial distribution, find the probability that (a) none of the chosen workers would be suffering from the disease (b) at least four of them would be suffering from the disease. [A] [3]
16. Define continuous uniform distribution. Mention its properties. [U] [3]

Part C

Essay questions

Answer any one question. Each question carries 12 marks.

17. The following data is related to number of wrong calls received at a call centre during a year. Fit a Poisson distribution to this data and obtain the expected frequencies

x	0	1	2	3	4
freq.	182	88	66	24	5

[An] [3]

18. Given $f(x) = \frac{x}{15}$; $x = 1, 2, 3, 4, 5$ and 0 elsewhere. Check whether it is a pmf. If yes, find (a) $P(2 \leq x < 4)$ (b) $P(x \text{ takes an odd number})$ (c) $P(\frac{1}{2} < x \leq \frac{5}{2})$ [U] [1]