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PGIIS 1016 A-16

M.A/M.Sc IInd Semester (CBCS) Degree Examination

Statistics

(Distribution Theory)

Paper : HCT-2.1

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

Answer any **SIX** questions from PART-A and **FIVE** Questions from PART-B

PART - A

(Marks : 6×5=30)

1. If x and y are two independent binomial variates with parameters $n_1=6$, $p=1/2$ and $n_2=4$, $p=1/2$ respectively, find

   i) $p(x+y=r)$

   ii) $p(x+y\geq 3)$

2. If x is a Poisson variable such that $p(x=2)=9p(x=4)+90.p(x=6)$, find

   i) The mean of x

   ii) The coefficient of skewness

3. If x is a random variable (r. v) with a continuous distribution function (d.f) F, then prove that F(x) has a uniform distribution on [0, 1]

4. Define normal distribution and obtain its median.

5. If x and y are independent r.v's with common p.d.f $f(x)=\begin{cases} e^{-x}, & x\geq 0 \\ 0, & x<0 \end{cases}$ find the p.d.f of x-y

6. Define chisquare distribution. Mention its characteristics.

7. Discuss the relationship between t and F distributions

8. Derive the p.d.f of n^{th} order statistics.

PART - B

Answer any Five questions

(Marks : 5 × 10 = 50)

9. If $x_1, x_2, \text{-------}, x_n$ are iid r.v's, then show that min $(x_1, x_2, \text{--------}, x_n)$ has a weibull distribution if the common distribution of x_i's is a weibull distribution.

10. If x follows $N(\mu, \sigma^2)$, find the p.d.f of $y=e^x$. using this result. show that $E(e^{tx})=\exp\left\{\mu t+\frac{t^2\sigma^2}{2}\right\}$ and also find the coefficient of variation of y.

11. If the r.v X has a standard Cauchy distribution, find the p.d.f of x^2.

12. Define truncated distribution. Find the mean and variance of the Poisson distribution truncated at x=0.

13. Let x and y be iid N(0, 1) r.v's. Find the distribution of x/y.

14. If (x, y) has a bivariate normal distribution. Show that the conditional distribution of y given X=x has univariate normal distribution.

15. Define non-central F distribution. Obtain its p.d.f.

16. Derive the p.d.f of range in a sample of size n.

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PGIIS 1018 A - 16

M.A/M.Sc. IInd Semester Degree Examination

Statistics

(Testing of Hypothesis)

Paper : HCT 2.2

Time : 3 Hours Maximum Marks : 80

Instructions to candidates :

Answer any six questions from Part - A and **five** from Part - B.

Part - A

(6×5=30 : Marks)

1. Define the following terms
   i) Null hypothesis
   ii) Alternative hypothesis
   iii) Type I error
   iv) Type II error
2. Define M.P and UMP tests
3. If $X \sim N(\mu, \sigma_0^2)$ where σ_0^2 is known, obtain a MPT of size α for testing $H_0: \mu = \mu_0$ vs $H_1: \mu = \mu_1$ $(\mu_1 > \mu_0)$
4. Explain MLR property and check whether p(λ) has MLR property or not?
5. Let X~B (N, θ). Obtain a UMP level α test for testing $H_0: \theta \leq \theta_0$ vs $H_1: \theta > \theta_0$
6. Obtain an approximate expression for the OC function of walds SPRT.
7. Discuss the regularity conditions that ensure the existence of MLE of θ in large samples.
8. Explain Mann-Whitney U-test procedure of non paremetric test.

Part - B

(5×10=50 : Marks)

9. a) Prove that the power of MPT is greater than or equal to its size.
   b) Let x~p(λ). obtain a MPT of size α for testing $H_0: \lambda = \lambda_0$ V_S $H_1: \lambda = \lambda$ $(\lambda_1 > \lambda_0)$

10. Define RPEF. Show that the family $\{N(\mu, \sigma_0^2) : \mu > 0\}$ is RPEF. Obtain a UMP level α-test for testing $H_0 : \mu \le \mu_1$ or $\mu \ge \mu_2$ V_s $H_1 : \mu_1 < \mu < \mu_2$.

11. Let (α, β) be the strength of the SPRT corresponding to the constants A and B. Let (α', β') be the strength corresponding to the SPRT with constants A' and B' where

$$A' = \frac{1-\beta}{\alpha} \ and \ B' = \frac{\beta}{1-\alpha}$$

Then show that $\alpha' + \beta' < \alpha + \beta$.

12. Obtain OC and ASN functions of Walds SPRT in the case of $N(\mu, \sigma_0^2)$ and also test H_0: $\mu = \mu_0$ vs $H_1 : \mu = \mu_1 (> \mu_0)$

13. Let X~N (μ, σ^2). Find UMPU best of size α for testing $H_0 : \mu = \mu_0$ vs $H_1 : \mu \neq \mu_0$

14. Obtain likelihood ratio test for testing $H_0 : \rho = 0$ vs $H_1 : \rho \neq 0$ where $\rho = \mu_1 - \mu_2$ in case of bivariate normal distribution.

15. Discuss the execution of Mann-Whitney U-test. Obtain the mean and variance under the null Hypothesis.

16. Write short notes on any two of the following.
    a) UMPU tests in case of RPEF.
    b) ASN function of SPRT
    c) Likelihood Ratio tests.
    d) Kolmogorov-smirnov test for goodness of fit.

PGIIS 1020 - A - 16

M.A/M.Sc. IInd Semester(CBCS) Degree Examination

Statistics

(Reliability Theory)

Paper : SCT - 2.1

Time : 3 Hours Maximum Marks : 80

Instructions to candidates:

Answer any **six** questions from part A and any **five** questions from part B.

Part - A

(6×5=30 : Marks)

1. For any arbitrary life distribution if the failure rate is constant then show that the life distribution is exponential.
2. Show that pareto distribution is DFR.
3. Define hazurd function. Calculate the hazard function for the weibull distribution.
4. Find the mean life time of a series system of 'k' components where life time of each component has exponential distribution with mean life θ
5. Distinguish between MJTF and MTBF with examples.
6. Show that the Renewal function m(t) satisfies the equation

$$m(t) = \int_0^t [1 - m(t-x)] d\, F(x)$$

7. Explain block replacement policy.
8. What are coherent structures? Give examples

Part - B

(5×10=50 : Marks)

9. Define IFR and DFR distributions. Examine whether the following distributions have IFR and DFR
   i) Gamma
   ii) Normal
10. a) Obtain the m/e of shape and scale parameters of weibull distribution using complete sample

b) Show that geometric distribution has constant failure rate.

11. Prove that DFR $\Rightarrow$ DFRA $\Rightarrow$ NWU $\Rightarrow$ NWUE

12. Distinguish between type-I and type-II censoring schemes. Find Mle and UMVUE of reliability of a unit with type-I censored sample using exponential distribution.

13. Define stress strength model. Obtain reliability of this model when both stress and strength have exponential distribution with parameters θ_1 and θ_2 respectively.

14. a) Define series system and parallel systems

b) Show that if the life time of each component of a series system of 'n' components has IFR distribution then the system life time distribution is IFR.

15. Test for the reliability hypothesis H_0: $R(t)=R_0(t)$ against H_1 : $R(t)<R_0(t)$, when the failure times follow exponential distribution under type II censoring schemes.

16. Write short notes on

a) Proportional hazard model

b) Age replacement policy

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PGIIS 1022 A-16
M.A/M.Sc IInd Semester Degree Examination
Statistics
(Basic Statistics)
Paper : OET-2.1

Time : 3 Hours Maximum Marks : 80

Instructions to candidate:

Answer any SIX questions from PART-A and **FIVE** full Questions from PART-B

PART - A **(6×5=30)**

1. Discuss the construction of frequency table
2. Define classification. Explain its types
3. What are the Pre-requisites of an ideal (Good) average?
4. Discuss the properties of standard Deviation
5. Write a note an Scattered diagram.
6. Discuss different types of Kurtosis
7. Define linear correlation. Discuss its types.
8. Define two lines of Regression. What are its uses.

PART - B

Answer any Five full questions **(5 × 10 = 50 Marks)**

9. a) Outline the construction of Histogram.
   b) Discuss the construction of less than ogive. What are its uses.
10. a) Distinguish between Regular and irregular distributions.
    b) Obtain the model marks for the following data :

Marks :	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40
No. of Students :	2	10	05	05	10	10	05	05

11. a) Define inter quartile range and Quartile deviation. Write their properties.
    b) Write a note on quartilles.

12. a) Write a note on Skewness.

b) Compute Karl Pearson's coefficient of skewness for the following data and interpret it.

13. a) Define coefficient of variation. What are its uses.

b) The marks in statistics obtained by the students of class - A and class - B are given below : Determine which class is more consistent is studying statistics :

Marks	5-15	15-25	25-35	35-45
A	11	28	09	01
B	11	25	09	04

14. a) Discuss the properties of Median.

b) Find Median for the following data :

C.I	18-20	20-22	22-23	23-24	24-26	26-30	30-35
Freq	4	10	09	17	20	15	05

15. a) Explain linear correlation.

b) Calculate Karl-Pearson's coefficient of correlation between expenditure an advertising and sales from the data given below and interpret it :

Advertising Expenses (Rs '000) :	39	65	62	90	82	75	25	98	36	78
Sales (Lakhs Rs) :	47	53	58	86	62	68	60	91	51	84

16. Write short notes on any Two of the following :

a) Bivariate frequency table :

b) Frequency Polygon

c) Variables and Attributes

d) Checking significance of correlation coefficient.