UG/II/STAT/H/III/17(Old)

2017

STATISTICS

[Honours]

PAPER – III

Full Marks : 100

Time : 4 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

[OLD SYLLABUS]

GROUP – A

Answer any **three** questions : 18×3

1. (*a*) Find the moment generating function of $X \sim N_p(\underline{\mu}, \Sigma)$. Hence show that any subvector of $\underline{X}$ also follows multivariate normal distribution. 10

(*b*) If $\underset{\sim}{X}_{P\times 1}$ follows $N_p(\underset{\sim}{\mu}, \Sigma)$, find out the distribution of $(\underset{\sim}{X}-\underset{\sim}{\mu})' \Sigma^{-1} (\underset{\sim}{X}-\underset{\sim}{\mu})$. 8

2. (*a*) What do you mean by multiple correlation coefficient ? Derive the formula of multiple correlation coefficient. 9

(*b*) Supose X_1, X_2, X_3 be three variates with the correlation coefficient ρ_{ij} between X_i and $X_j (i \neq j)$. Show that

$$\rho_{12}^2 + \rho_{13}^2 + \rho_{23}^2 \leq 2\rho_{12}\rho_{13}\rho_{23} + 1.$$

Hence show that if

$\rho_{12} = r, \rho_{13} = -r$, then $1 \leq \rho_{23} \leq 1-2r^2$. 9

3. Define an F statistic with $df = (n_1, n_2)$. Hence obtain its probability density function. Also, obtain its mean and variance. 12 + 6

4. (*a*) If X and Y are independents distributed bionomial random variables with parameters (n_1, p) and (n_2, p), find the distribution of $X + Y$. Also obtain the conditional distribution of X, given $X + Y = n$. 12

(*b*) If X follows $N(0, 1)$, find the p.d.f of $Y = X^2$. 6

5. (*a*) If $X_1, X_2, \ldots . X_n$ are distributed Independently as normal variable with means $\mu_i (i = 1, 2, \ldots n)$ and variances $\sigma_i^2 (i = 1 \ldots n)$ie.$(X_i \sim N(\mu_i, \sigma_i^2))$, $i = 1, \ldots n$, show that

$a + \sum_{i=1}^{n} b_i X_i$ (at least are b_i being non-zero)

is normally distributed. Find its mean and variance. 12

(*b*) If X_1, X_2 are $U(0, 1)$ random variables. Obtain the p.d.f of $X_1 + X_2$. 6

GROUP – B

Answer any **one** question : 18×1

6. (*a*) What do you mean by a control chart for statistical quality control ? Define 3-σ limits and probability limits. 8

(*b*) Describe the construction of mean chart when the parametric values are known and when they are unknown. 10

7. (*a*) Explain the terms AOQL, LTPD, producer's risk and consumer's risk. 8

(*b*) Describe double sampling plan for attributed and derive its OC function. 10

GROUP – C

Answer any **one** question : 18 × 1

8. (*a*) Write an algorithm to calculate the standard deviation and the range of an ungrouped data set. 9

(*b*) Write an algorithm to find the Prime numbers from the first 100 natural numbers. 9

9. (*a*) Write a C-programme to generate a random sample of size 100 from the standard normal distribution. 12

(*b*) Write a C-programme to calculate A.M. and H.M of ungrouped data. 6
