

Tuesday 05/11/2019

10:00 AM 01:00 PM



W-2019-3585

Max. Marks: 60.

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Use of non-programmable calculator is **ALLOWED**.
- 3) Figures to the right indicate **FULL** marks.
- 4) Assume suitable data if **NECESSARY**.

- Q.1** An instructor of mathematics wishes to determine the relationship of grades on a final examination to grades on two quizzes given during the semester. Costing x_1 , x_2 , and x_3 the grades of a student on the first quiz, second quiz and final examination respectively, he made the following computations for a total of 120 students: (10)

$\bar{x}_1 = 6.8$	$\bar{x}_2 = 0.7$	$\bar{x}_3 = 74$
$s_1 = 1.0$	$s_2 = 0.80$	$s_3 = 9.0$
$r_{12} = 0.60$	$r_{13} = 0.70$	$r_{23} = 0.65$

- i) Find the least square regression equations of x_3 on x_1 and x_2
- ii) Estimate the final grades of two students who scored respectively 9 and 7, 4 and 8 on the two quizzes.

OR

- Q.1** Following data represent the number of units of production per day turned out by 5 different workers using 4 different types of machines: (10)

Workers	Machine type			
	A	B	C	D
1	44	38	43	36
2	46	40	52	43
3	34	36	44	32
4	43	38	46	33
5	38	42	49	39

- i) Test whether the mean productivity is same for the different machine types.
- ii) Test whether 5 men differ with respect to mean productivity.
(for $v_3 = 12$, $F_{0.05} = 3.49$, and for $v_4 = 12$, $F_{0.05} = 3.26$)

- Q.2** Let (x_1, x_2, \dots, x_n) be a random sample of a binomial random variable x with parameter (m, p) , where m is assumed to be known and p is unknown. Determine the maximum-likelihood estimators of p . (10)

OR

- Q.2** What are characteristics of good estimates? Explain. (10)

- Q.3** Let X_1, X_2, \dots, X_n be a random sample from a normal distribution with mean and variance both unknown. Obtain the sufficient statistics. (10)

OR

P.T.O.

Q.3 Let X_1, X_2, \dots, X_n be a random sample from Bernoulli distribution: (10)

$$f(x, \theta) = \begin{cases} \theta^x (1-\theta)^{1-x}; & x=0,1 \\ 0 & \text{otherwise} \end{cases}$$

Show that $\sum_{i=1}^n x_i$ is a complete statistic for θ .

Q.4 Let X_1, X_2, \dots, X_n be a random sample of a normal random variable X with mean μ (10) and variance 100.

Let $H_0: \mu = 50$

$H_1: \mu = \mu_1, (\mu_1 > 50)$

And sample size $n = 25$. As a decision procedure, we use the rule to reject H_0 if $\bar{x} \geq 52$, where \bar{x} is value of the sample mean:

- i) Find the probability of type – I error.
- ii) Find the probability of type – II error.

When $\mu_1 = 53$ and $\mu_1 = 55$

(Given: $\phi(1) = 0.8413, \phi(-0.5) = 0.3085, \phi(1.5) = 0.9332$)

OR

Q.4 Derive the Neyman-Pearson test. (10)

Q.5 In a study done from various streams of college 60 students, with equal number of students drawn from each stream are interviewed and their intention to join the Drama club of college was noted. (10)

	B.Sc.	B.A.	B.Com.	M.A.	M.Com.
No. in each class :	5	9	11	16	19

It was expected that 12 students from each class would join the Drama club. Using Kolmogorove-Smirnov test to find if there is any difference among student classes with regard to their intention of joining the Drama club. (table value $D_{0.05} = 0.175$)

OR

Q.5 Use the sign test to see if there is difference between the number of days unit collection of an account receivable before and after a new collection policy. Use 0.05 as the significance level. (10)

Before	30	28	34	35	40	42	33	38	34	45	28	27	25	41	36
After	32	29	33	32	37	43	40	41	37	44	27	33	30	38	36

Q.6 a) Write the command in R console to create two lists, each containing 5 elements. Convert the list into vectors and perform addition on two vectors display the resultant vector. (05)

b) Write an R program to print the values in vectors using 'for loop'. (05)

OR

Q.6 a) Write the command in R console to create a new data frame containing the 'age' parameter from the existing data frame check if the result is a data frame or not. (05)

b) Write on R program to multiply two numbers using function with a default value. Assume default value as NULL. (05)

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