

**Ph.D. IN STATISTICS
(PHDSTAT)**

Term-End Examination

00361

December, 2017

**RST-001 : RESEARCH METHODOLOGY IN
STATISTICS**

Time : 3 hours

Maximum Marks : 100

Note : *Question no. 1 is compulsory. Attempt any four questions from questions no. 2 to 7. Non-programmable scientific calculator is allowed. Symbols have their usual meanings.*

1. (a) State whether the following statements are *True* or *False*. Give reasons in support of your answer. $5 \times 2 = 10$
- (i) The weighted mean of n natural numbers is $\frac{(2n + 1)}{3}$, if weights are the corresponding numbers.
- (ii) The values of regression coefficients b_{yx} and b_{xy} are $\frac{1}{5}$ and 10, respectively.

- (iii) The sum of squares of errors in a two-way ANOVA having 4 rows and 5 columns is given as 48. The mean sum of squares will be 4 for the same.
 - (iv) F-test is used for testing the population mean.
 - (v) Modelling research and algorithmic research have the same process of research.
- (b) Differentiate between the following, along with one example each : 5×2=10
- (i) Design Oriented Report and Research Oriented Report
 - (ii) Multiple Bar Diagram and Sub-divided Bar Diagram
 - (iii) Level of Significance and Test of Significance
 - (iv) Mean Deviation and Quartile Deviation
 - (v) One-tail Test and Two-tail Test
2. List and explain the steps of research process (in 250 words). 20
3. Design a questionnaire to conduct a study for a tele-service company to find the expectations of customers using its mobile tower in a particular area in Delhi. 20

4. (a) Define Data and give some examples of data. Distinguish between Primary data and Secondary data. 8
- (b) Consider two different businesses with equal initial investments and equal lives whose expected cash flows in crôres are summarised in the following table :

| Period : | 1 | 2 | 3 | 4 | 5 |
|--------------|-----|----|----|-----|-----|
| Business A : | 80 | 85 | 70 | 100 | 115 |
| Business B : | 100 | 70 | 90 | 80 | 150 |

Identify which of the businesses is more consistent in terms of cash flow. 12

5. (a) From the data given below, obtain
- (i) the two regression equations,
 - (ii) the coefficient of correlation between the marks in Economics and Statistics, and
 - (iii) the most likely marks in Statistics when the marks in Economics are 35. 15

| Marks in Economics | Marks in Statistics |
|--------------------|---------------------|
| 25 | 43 |
| 28 | 46 |
| 35 | 49 |
| 32 | 41 |
| 31 | 36 |
| 36 | 32 |
| 29 | 31 |
| 38 | 33 |
| 34 | 33 |
| 32 | 39 |

- (b) It is required to test whether the products of two machines A_1 and A_2 in a factory are producing articles of equal weight on an average. Test on the basis of a sample of size 50 of products from machine A_1 with the average weight 1.50 kg and a standard deviation of 0.31 kg. Similarly another sample of size 60 of products from machine A_2 gave the average weight 1.75 kg with a standard deviation of 0.51 kg.

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6. (a) The following table shows the classification of 4000 workers in a factory, according to the disciplinary action taken by the management of the factory and their promotional experience :

| Disciplinary Action | Promotional Experience | | Total |
|---------------------|------------------------|--------------|-------|
| | Promoted | Not Promoted | |
| Non-offenders | 300 | 900 | 1200 |
| Offenders | 100 | 2700 | 2800 |
| Total | 400 | 3600 | 4000 |

Use a suitable test of significance to determine if there is any evidence to support that there was any association between disciplinary action and the promotional experience of the workers in this factory at 5% level of significance. Given that $\chi^2(1)$ at 5% level of significance = 3.84.

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- (b) The following data shows per-hectare yield for three varieties of wheat each grown on four plots :

| Plot of Land | Variety of Wheat | | |
|--------------|------------------|----------------|----------------|
| | A ₁ | A ₂ | A ₃ |
| 1 | 16 | 15 | 15 |
| 2 | 17 | 15 | 14 |
| 3 | 13 | 13 | 13 |
| 4 | 18 | 17 | 14 |

Test whether there is a significant difference in per-hectare average yield (i) due to different varieties, and (ii) due to four plots of land. Given that $F(2, 6) = 5.14$ and $F(3, 6) = 4.74$.

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7. What are the factors involved in writing a research report ? Explain them in brief.

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