# RAMAKRISHNA MISSION VIDYAMANDIRA

**(Residential Autonomous College affiliated to University of Calcutta)**

**SECOND YEAR [2017 - 20]**

**B.A./B.Sc. THIRD SEMESTER (July – December) 2018**

**Mid-Semester Examination, September 2018**

Date : 27/09/2018 — **STATISTICS (General)**

Time : 12 noon - 1 pm — Paper: III — Full Marks: 25

**[Use a separate Answer Book for each group]**

## Group : A

Answer **any two** questions of the following**:** (2 × 5)

1. Explain different types of errors in index number.

2. State Fisher's formula to obtain index number. Give reason why is this formula called an ideal formula to obtain index number?

3. Discuss how you will proceed for constructing a cost of living index number.

## Group : B

Answer **any three** questions of the following**:** (3 × 5)

4. If X follows Normal $\left(10,5^2\right)$ and $X_1, X_2, ....., X_{501}$ is a random sample of size 501 from the population X, then what is the expected value of the sample variance $S^2$?

5. If T follows $t_{19}$ (i.e. t - distribution with degrees of freedom 19) then what is the value of the constant c such that P (|T| <= c) = 0.95? [t - table (no pun intended!) is provided overleaf]

6. If $X_1, X_2, ....., X_n$ is a random sample from a distribution with density function f(x; $\theta$)

   $= 1/\theta$ if $0 < x \leq \theta$

   = 0 otherwise

   then what is the maximum likelihood estimator of $\theta$?

7. Let $X_1, X_2, ....., X_n$ be a random sample of size n from a population with density f(x; $\theta$)

   $= \frac{1}{\theta}.e^{\frac{-x}{\theta}}$ if $0 < x < \infty$

   = 0 otherwise, where $\theta > 0$ is a parameter.

   Are the estimators $X_1$ and $\bar{X}$ unbiased? Given $X_1$ and $\bar{X}$, which one is a better estimator of $\theta$?

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## TABLE IV *t*-DISTRIBUTION*

*Values of* $t_{\alpha,\nu}$

| $\nu$ \ $\alpha$ | 0.05 | 0.025 | 0.01 | 0.005 |
|---|---|---|---|---|
| 1 | 6.314 | 12.706 | 31.821 | 63.657 |
| 2 | 2.920 | 4.303 | 6.965 | 9.925 |
| 3 | 2.353 | 3.182 | 4.541 | 5.841 |
| 4 | 2.132 | 2.776 | 3.747 | 4.604 |
| 5 | 2.015 | 2.571 | 3.365 | 4.032 |
| 6 | 1.943 | 2.447 | 3.143 | 3.707 |
| 7 | 1.895 | 2.365 | 2.998 | 3.499 |
| 8 | 1.860 | 2.306 | 2.896 | 3.355 |
| 9 | 1.833 | 2.262 | 2.821 | 3.250 |
| 10 | 1.812 | 2.228 | 2.764 | 3.169 |
| 11 | 1.796 | 2.201 | 2.718 | 3.106 |
| 12 | 1.782 | 2.179 | 2.681 | 3.055 |
| 13 | 1.771 | 2.160 | 2.650 | 3.012 |
| 14 | 1.761 | 2.145 | 2.624 | 2.977 |
| 15 | 1.753 | 2.131 | 2.602 | 2.947 |
| 16 | 1.746 | 2.120 | 2.583 | 2.921 |
| 17 | 1.740 | 2.110 | 2.567 | 2.898 |
| 18 | 1.734 | 2.101 | 2.552 | 2.878 |
| 19 | 1.729 | 2.093 | 2.539 | 2.861 |
| 20 | 1.725 | 2.086 | 2.528 | 2.845 |
| 21 | 1.721 | 2.080 | 2.518 | 2.831 |
| 22 | 1.717 | 2.074 | 2.508 | 2.819 |
| 23 | 1.714 | 2.069 | 2.500 | 2.807 |
| 24 | 1.711 | 2.064 | 2.492 | 2.797 |
| 25 | 1.708 | 2.060 | 2.485 | 2.787 |
| 26 | 1.706 | 2.056 | 2.479 | 2.779 |
| 27 | 1.703 | 2.052 | 2.473 | 2.771 |
| 28 | 1.701 | 2.048 | 2.467 | 2.763 |
| 29 | 1.699 | 2.045 | 2.462 | 2.756 |
| 30 | 1.697 | 2.042 | 2.457 | 2.750 |
| 40 | 1.684 | 2.021 | 2.423 | 2.704 |
| 60 | 1.671 | 2.000 | 2.390 | 2.660 |
| 120 | 1.658 | 1.980 | 2.358 | 2.617 |
| $\infty$ | 1.645 | 1.960 | 2.326 | 2.576 |

*Abridged from Table 12 of *Biometrika Tables for Statisticians*, Vol. I, with the kind permission of the Biometrika Trustees.