

UNIVERSITY OF COLOMBO – SRI LANKA

FACULTY OF ARTS

SPECIAL DEGREE EXAMINATION IN ARTS (GEOGRAPHY) – PART I

SECOND SEMESTER FINAL EXAMINATION (2022/2023)

GYG 2217 – Statistics

Time: Two (02) Hours

Answer any 03 questions only.

Graph papers will be provided. Use of calculator is allowed.

1. (i) Explain the differences between the following pairs with examples.  
(a) Data and Information  
(b) Quantitative Variable and Qualitative Variable  
(c) Nominal Scale and Ordinal Scale  
(06 marks)
- (ii) **Table No. 1** shows the weight in kilograms of 50 university students.  
(a) Present the data using a frequency distribution table. (Set the class intervals as 30-35, 35-40, ... etc)  
(08 marks)  
(b) Draw a Histogram and a Frequency Polygon.  
(04 marks)  
(c) Comment on the weight of university students.  
(02 marks)  
(Total 20 marks)
2. (i) Define Mean, Median and Mode.  
(03 marks)
- (ii) What are the differences between Descriptive Statistics and Inferential Statistics?  
(03 marks)
- (iii) A police station kept records of the number of road traffic accidents in their area for 100 days. The data is shown in **Table No. 2**.  
**Comment on road accidents using a suitable chart.**  
(04 marks)
- (iv) The **Table No. 3** gives data on the heights, in cm, of 60 children.  
**Find mean, median and mode**  
(10 marks)  
(Total 20 marks)



3. The sales statistics of 10 salesmen of various experiences in a department store for the last one year period are given in **Table No.4**.
- (i) Find regression equation of annual sales on years of experience. (12 marks)
  - (ii) Interpret the regression equation. (02 marks)
  - (iii) Test the hypothesis:  $H_1; \beta > 0$ , using  $\alpha = 0.05$  (04 marks)
  - (iv) Predict the annual sales volume of person's who have 12 and 15 years of experience. (02 marks)
- (Total 20 marks)
4. (i) What is the Chi-square Test? (02 marks)
- (ii) What are the differences between Goodness-of-fit test and Independence Contingency Table Test? (04 marks)
- (iii) An ice cream manufacturer conducts a nationwide survey of favorite flavors of ice cream in various geographic regions. The data is shown in **Table No. 5**. Do the data in that table show that geographic locations are independent of favorite ice cream flavors? Test at 5% significance level. (14 marks)
- (Total 20 marks)
5. The monthly rainfall data for the years 2013, 2014 and 2015 in Colombo district is shown in **Table No. 6**.  
Using **the moving-average** method;
- (i) Draw a time series plot for the data. (04 marks)
  - (ii) Determine the trend values using the 3 months moving-average. (08 marks)
  - (iii) Draw the trend line on the time series. (02 marks)
  - (iv) Calculate the seasonal indexes for each month. (04 marks)
  - (v) Draw a graph for seasonal indexes (02 marks)
- (Total 20 marks)



**Table No. 1**

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 42 | 49 | 44 | 57 | 51 | 46 | 48 | 47 | 56 | 58 |
| 54 | 59 | 49 | 52 | 54 | 54 | 40 | 46 | 37 | 48 |
| 58 | 45 | 39 | 41 | 43 | 45 | 34 | 51 | 63 | 49 |
| 42 | 51 | 64 | 46 | 41 | 42 | 40 | 49 | 50 | 38 |
| 47 | 62 | 61 | 32 | 57 | 39 | 41 | 58 | 37 | 41 |

**Table No. 2**

| Number of Accidents | Frequency |
|---------------------|-----------|
| 0                   | 4         |
| 1                   | 10        |
| 2                   | 22        |
| 3                   | 23        |
| 4                   | 16        |
| 5                   | 17        |
| 6                   | 6         |
| 7                   | 1         |
| 8                   | 1         |
| Total               | 100       |

**Table No. 3**

| Class Interval | Frequency |
|----------------|-----------|
| 140-150        | 6         |
| 150-160        | 16        |
| 160-170        | 21        |
| 170-180        | 8         |
| 180-190        | 9         |



Table No.4

| Years of Experience | Annual Sales |
|---------------------|--------------|
| 1                   | 80           |
| 3                   | 97           |
| 4                   | 92           |
| 4                   | 102          |
| 6                   | 103          |
| 8                   | 111          |
| 10                  | 119          |
| 10                  | 123          |
| 11                  | 117          |
| 13                  | 136          |

Table No. 5

| Flavor / geographic areas | East | North | West | South | Total |
|---------------------------|------|-------|------|-------|-------|
| Strawberry                | 8    | 10    | 12   | 15    | 45    |
| Chocolate                 | 31   | 32    | 21   | 28    | 112   |
| Vanilla                   | 27   | 22    | 22   | 30    | 101   |
| Fruit & Nut               | 8    | 11    | 19   | 8     | 46    |
| Butterscotch              | 15   | 15    | 15   | 15    | 60    |
| Karutha Kolumban          | 7    | 6     | 8    | 6     | 27    |
| Total                     | 96   | 96    | 97   | 102   | 391   |

Table No. 6

| Month     | Year |      |      |
|-----------|------|------|------|
|           | 2013 | 2014 | 2015 |
| January   | 42   | 23   | 24   |
| February  | 148  | 21   | 106  |
| March     | 60   | 103  | 168  |
| April     | 143  | 186  | 228  |
| May       | 291  | 105  | 184  |
| June      | 237  | 115  | 139  |
| July      | 184  | 31   | 17   |
| August    | 20   | 242  | 53   |
| September | 209  | 239  | 435  |
| October   | 233  | 287  | 315  |
| November  | 167  | 427  | 331  |
| December  | 30   | 362  | 312  |



### Percentage Points of the Normal Distribution

| P    | Z      |
|------|--------|
| 90%  | 0.1257 |
| 80%  | 0.2533 |
| 70%  | 0.3853 |
| 60%  | 0.5244 |
| 50%  | 0.6745 |
| 40%  | 0.8416 |
| 30%  | 1.0364 |
| 20%  | 1.2816 |
| 10%  | 1.6449 |
| 5%   | 1.9600 |
| 2%   | 2.3263 |
| 1%   | 2.5758 |
| 0.2% | 3.0902 |
| 0.1% | 3.2905 |



## The Students t Distribution

Distribution of t for given probability Levels

| df  | <i>Level of significance for one-tailed test</i> |       |        |        |        |         |
|-----|--------------------------------------------------|-------|--------|--------|--------|---------|
|     | 0.10                                             | 0.05  | 0.025  | 0.01   | 0.005  | 0.0005  |
|     | <i>Level of significance for two-tailed test</i> |       |        |        |        |         |
|     | 0.20                                             | 0.10  | 0.05   | 0.02   | 0.01   | 0.001   |
| 1   | 3.078                                            | 6.314 | 12.706 | 31.821 | 63.657 | 636.619 |
| 2   | 1.886                                            | 2.920 | 4.303  | 6.965  | 9.925  | 31.598  |
| 3   | 1.638                                            | 2.353 | 3.182  | 4.541  | 5.841  | 12.941  |
| 4   | 1.533                                            | 2.132 | 2.776  | 3.747  | 4.604  | 8.610   |
| 5   | 1.476                                            | 2.015 | 2.571  | 3.365  | 4.032  | 6.859   |
| 6   | 1.440                                            | 1.943 | 2.447  | 3.143  | 3.707  | 5.959   |
| 7   | 1.415                                            | 1.895 | 2.365  | 2.998  | 3.499  | 5.405   |
| 8   | 1.397                                            | 1.860 | 2.306  | 2.896  | 3.355  | 5.041   |
| 9   | 1.383                                            | 1.833 | 2.262  | 2.821  | 3.250  | 4.781   |
| 10  | 1.372                                            | 1.812 | 2.228  | 2.764  | 3.169  | 4.587   |
| 11  | 1.363                                            | 1.796 | 2.201  | 2.718  | 3.106  | 4.437   |
| 12  | 1.356                                            | 1.782 | 2.179  | 2.681  | 3.055  | 4.318   |
| 13  | 1.350                                            | 1.771 | 2.160  | 2.650  | 3.012  | 4.221   |
| 14  | 1.345                                            | 1.761 | 2.145  | 2.624  | 2.977  | 4.140   |
| 15  | 1.341                                            | 1.753 | 2.131  | 2.602  | 2.947  | 4.073   |
| 16  | 1.337                                            | 1.746 | 2.120  | 2.583  | 2.921  | 4.015   |
| 17  | 1.333                                            | 1.740 | 2.110  | 2.567  | 2.898  | 3.965   |
| 18  | 1.330                                            | 1.734 | 2.101  | 2.552  | 2.878  | 3.992   |
| 19  | 1.328                                            | 1.729 | 2.093  | 2.539  | 2.861  | 3.883   |
| 20  | 1.325                                            | 1.725 | 2.086  | 2.528  | 2.845  | 3.850   |
| 21  | 1.323                                            | 1.721 | 2.080  | 2.518  | 2.831  | 3.819   |
| 22  | 1.321                                            | 1.717 | 2.074  | 2.508  | 2.819  | 3.792   |
| 23  | 1.319                                            | 1.714 | 2.069  | 2.500  | 2.807  | 3.767   |
| 24  | 1.318                                            | 1.711 | 2.064  | 2.492  | 2.797  | 3.745   |
| 25  | 1.316                                            | 1.708 | 2.060  | 2.485  | 2.787  | 3.725   |
| 26  | 1.315                                            | 1.706 | 2.056  | 2.479  | 2.779  | 3.707   |
| 27  | 1.314                                            | 1.703 | 2.052  | 2.473  | 2.771  | 3.690   |
| 28  | 1.313                                            | 1.701 | 2.048  | 2.467  | 2.763  | 3.674   |
| 29  | 1.311                                            | 1.699 | 2.045  | 2.462  | 2.756  | 3.659   |
| 30  | 1.310                                            | 1.697 | 2.042  | 2.457  | 2.750  | 3.646   |
| 40  | 1.303                                            | 1.684 | 2.021  | 2.423  | 2.704  | 3.551   |
| 60  | 1.296                                            | 1.671 | 2.000  | 2.390  | 2.660  | 3.460   |
| 120 | 1.289                                            | 1.658 | 1.980  | 2.358  | 2.617  | 3.373   |



**Distribution of Chi-square for Given Probability Levels**

| DF | Probability |         |         |         |        |       |       |      |      |      |       |      |       |
|----|-------------|---------|---------|---------|--------|-------|-------|------|------|------|-------|------|-------|
|    | 0.995       | 0.99    | 0.975   | 0.95    | 0.9    | 0.75  | 0.5   | 0.25 | 0.1  | 0.05 | 0.025 | 0.01 | 0.005 |
| 1  | 0.00004     | 0.00016 | 0.00098 | 0.00393 | 0.0158 | 0.102 | 0.455 | 1.32 | 2.71 | 3.84 | 5.02  | 6.63 | 7.88  |
| 2  | 0.01        | 0.0201  | 0.0506  | 0.103   | 0.211  | 0.575 | 1.39  | 2.77 | 4.61 | 5.99 | 7.38  | 9.21 | 10.6  |
| 3  | 0.0717      | 0.115   | 0.216   | 0.352   | 0.584  | 1.21  | 2.37  | 4.11 | 6.25 | 7.81 | 9.35  | 11.3 | 12.8  |
| 4  | 0.207       | 0.297   | 0.484   | 0.711   | 1.06   | 1.92  | 3.36  | 5.39 | 7.78 | 9.49 | 11.1  | 13.3 | 14.9  |
| 5  | 0.412       | 0.554   | 0.831   | 1.15    | 1.61   | 2.67  | 4.35  | 6.63 | 9.24 | 11.1 | 12.8  | 15.1 | 16.7  |
| 6  | 0.676       | 0.872   | 1.24    | 1.64    | 2.2    | 3.45  | 5.35  | 7.84 | 10.6 | 12.6 | 14.4  | 16.8 | 18.5  |
| 7  | 0.989       | 1.24    | 1.69    | 2.17    | 2.83   | 4.25  | 6.35  | 9.04 | 12   | 14.1 | 16    | 18.5 | 20.3  |
| 8  | 1.34        | 1.65    | 2.18    | 2.73    | 3.49   | 5.07  | 7.34  | 10.2 | 13.4 | 15.5 | 17.5  | 20.1 | 22    |
| 9  | 1.73        | 2.09    | 2.7     | 3.33    | 4.17   | 5.9   | 8.34  | 11.4 | 14.7 | 16.9 | 19    | 21.7 | 23.6  |
| 10 | 2.16        | 2.56    | 3.25    | 3.94    | 4.87   | 6.74  | 9.34  | 12.5 | 16   | 18.3 | 20.5  | 23.2 | 25.2  |
| 11 | 2.6         | 3.05    | 3.82    | 4.57    | 5.58   | 7.58  | 10.3  | 13.7 | 17.3 | 19.7 | 21.9  | 24.7 | 26.8  |
| 12 | 3.07        | 3.57    | 4.4     | 5.23    | 6.3    | 8.44  | 11.3  | 14.8 | 18.5 | 21   | 23.3  | 26.2 | 28.3  |
| 13 | 3.57        | 4.11    | 5.01    | 5.89    | 7.04   | 9.3   | 12.3  | 16   | 19.8 | 22.4 | 24.7  | 27.7 | 29.8  |
| 14 | 4.07        | 4.66    | 5.63    | 6.57    | 7.79   | 10.2  | 13.3  | 17.1 | 21.1 | 23.7 | 26.1  | 29.1 | 31.3  |
| 15 | 4.6         | 5.23    | 6.26    | 7.26    | 8.55   | 11    | 14.3  | 18.2 | 22.3 | 25   | 27.5  | 30.6 | 32.8  |
| 16 | 5.14        | 5.81    | 6.91    | 7.96    | 9.31   | 11.9  | 15.3  | 19.4 | 23.5 | 26.3 | 28.8  | 32   | 34.3  |
| 17 | 5.7         | 6.41    | 7.56    | 8.67    | 10.1   | 12.8  | 16.3  | 20.5 | 24.8 | 27.6 | 30.2  | 33.4 | 35.7  |
| 18 | 6.26        | 7.01    | 8.23    | 9.39    | 10.9   | 13.7  | 17.3  | 21.6 | 26   | 28.9 | 31.5  | 34.8 | 37.2  |
| 19 | 6.84        | 7.63    | 8.91    | 10.1    | 11.7   | 14.6  | 18.3  | 22.7 | 27.2 | 30.1 | 32.9  | 36.2 | 38.6  |
| 20 | 7.43        | 8.26    | 9.59    | 10.9    | 12.4   | 15.5  | 19.3  | 23.8 | 28.4 | 31.4 | 34.2  | 37.6 | 40    |
| 21 | 8.03        | 8.9     | 10.3    | 11.6    | 13.2   | 16.3  | 20.3  | 24.9 | 29.6 | 32.7 | 35.5  | 38.9 | 41.4  |
| 22 | 8.64        | 9.54    | 11      | 12.3    | 14     | 17.2  | 21.3  | 26   | 30.8 | 33.9 | 36.8  | 40.3 | 42.8  |
| 23 | 9.26        | 10.2    | 11.7    | 13.1    | 14.8   | 18.1  | 22.3  | 27.1 | 32   | 35.2 | 38.1  | 41.6 | 44.2  |
| 24 | 9.89        | 10.9    | 12.4    | 13.8    | 15.7   | 19    | 23.3  | 28.2 | 33.2 | 36.4 | 39.4  | 43   | 45.6  |
| 25 | 10.5        | 11.5    | 13.1    | 14.6    | 16.5   | 19.9  | 24.3  | 29.3 | 34.4 | 37.7 | 40.6  | 44.3 | 46.5  |
| 26 | 11.2        | 12.2    | 13.8    | 15.4    | 17.3   | 20.8  | 25.3  | 30.4 | 35.6 | 38.9 | 41.9  | 45.6 | 48.3  |
| 27 | 11.8        | 12.9    | 14.6    | 16.2    | 18.1   | 21.7  | 26.3  | 31.5 | 36.7 | 40.1 | 43.2  | 47   | 49.6  |
| 28 | 12.5        | 13.6    | 15.3    | 16.9    | 18.9   | 22.7  | 27.3  | 32.6 | 37.9 | 41.3 | 44.5  | 48.3 | 51    |
| 29 | 13.1        | 14.3    | 16      | 17.7    | 19.8   | 23.6  | 28.3  | 33.7 | 39.1 | 42.6 | 45.7  | 49.6 | 52.3  |
| 30 | 13.8        | 15      | 16.8    | 18.5    | 20.6   | 24.5  | 29.3  | 34.8 | 40.3 | 43.8 | 47    | 50.9 | 53.7  |