

**ASSIGNMENT**

**BUM2413 APPLIED STATISTICS**

**SEMESTER II 2020/2021**

**GROUP NAME**: PARENTHESE

|  |  |  |
| --- | --- | --- |
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|  |
| --- |
| **LECTURER** |
| MISS NUR ZAHIRAH BINTI MD NOOR |

# PART 2

|  |  |  |
| --- | --- | --- |
| **FOR EXAMINER USE ONLY** | | |
| **Question**  **Marks** | **Marks Question** | **Your Marks** |
| **1** |  |  |
| **2** |  |  |
| **TOTAL** |  |  |

1. A research firm tests the miles per gallon characteristics of three brands of gasoline. Because of different gasoline performance characteristics in different brands of automobiles, five brands of automobiles are selected and treated as blocks in the experiment; that is, each brand of automobile is tested with each type of gasoline. The results of the experiment (in miles per gallon) is given in **Table 2.**
   1. How many factors and treatments involved in the study? State the factors and list all the possible treatments.

**ANSWER: -**

* There are 2 factors involved.
  + The factors are the brands of automobiles.
  + types of gasoline brands.
* Treatments involved = a x b = 5 x 3 = 15 treatments.

1. automobile A gasoline I
2. automobile A gasoline II
3. automobile A gasoline III
4. automobile B gasoline I
5. automobile B gasoline II
6. automobile B gasoline III
7. automobile C gasoline I
8. automobile C gasoline II
9. automobile C gasoline III
10. automobile D gasoline I
11. automobile D gasoline II
12. automobile D gasoline III
13. automobile E gasoline I
14. automobile E gasoline II
15. automobile E gasoline III
    1. State the independent and dependent variables.

**ANSWER: -**

**Independent variables**: miles per gallon characteristics of three brands of gasoline

**Dependent variables**: gasoline performance characteristics in different brands of automobiles

* 1. You are required to randomly generate data to fill up **Table 2** using random number generator in *Microsoft Excel*. Please follow the following requirements:
     1. The data value should be within the range (18, 34).
     2. The numbers of data for each treatment **must** be the same. (at least two data for each treatment)

**ANSWER: -**

|  |  |  |  |
| --- | --- | --- | --- |
| Automobiles | Gasolines Brands | | |
|  | I | II | III |
| A | 29 | 28 | 31 |
| B | 20 | 31 | 25 |
| C | 33 | 33 | 29 |
| D | 26 | 25 | 27 |
| E | 33 | 18 | 33 |

* 1. Based on your answer in **(c)**, is there any interaction effect between automobiles and gasoline brands on the miles per gallon at 6% significance level. Use *Microsoft Excel* and P-value approach to solve this problem.

**ANSWER: -**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Anova: Two-Factor Without Replication | | |  |  |  |  |
|  |  |  |  |  |  |  |
| *SUMMARY* | *Count* | *Sum* | *Average* | *Variance* |  |  |
| A | 3 | 88 | 29.33333 | 2.333333 |  |  |
| B | 3 | 76 | 25.33333 | 30.33333 |  |  |
| C | 3 | 95 | 31.66667 | 5.333333 |  |  |
| D | 3 | 78 | 26 | 1 |  |  |
| E | 3 | 84 | 28 | 75 |  |  |
|  |  |  |  |  |  |  |
| I | 5 | 141 | 28.2 | 29.7 |  |  |
| II | 5 | 135 | 27 | 34.5 |  |  |
| III | 5 | 145 | 29 | 10 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Rows | 78.93333 | 4 | 19.73333 | 0.724602 | 0.599202 | 3.550252 |
| Columns | 10.13333 | 2 | 5.066667 | 0.186047 | 0.833727 | 4.082062 |
| Error | 217.8667 | 8 | 27.23333 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 306.9333 | 14 |  |  |  |  |

1. Business 2.0’s first annual employment survey provided data showing the typical annual salary (in RM thousands) for 97 different jobs. **Table 1** show the annual salary for 30 different jobs in three fields: computer software and hardware, construction, and engineering.
   1. Identify the control and response variables.

**ANSWER: -**

* **Control Variable**: 30 Different Jobs in Three Fields
  + Computer Software and Hardware
  + Construction
  + Engineering
* **Response Variable**: Typical Annual Salary (in RM thousands) for 97 different jobs.
  1. You are required to randomly generate data to fill up **Table 1** using random number generator in *Microsoft Excel*. Please follow the following requirements:
     1. The data value should be within the range (41,105).
     2. The number of data for each job field **must not necessarily** be the same.

**ANSWER: -**

|  |  |  |
| --- | --- | --- |
| Computer | Construction | Engineering |
| 85 | 95 | 76 |
| 64 | 100 | 99 |
| 102 | 44 | 54 |
| 91 | 105 | 88 |
| 80 | 85 | 102 |
| 100 | 103 | 41 |
| 81 | 48 | 81 |
| 100 | 94 | 72 |
| 98 | 72 | 68 |
| 77 | 56 | 79 |
| 90 | 70 | 81 |
| 58 | 94 | 45 |
| 79 | 88 | 74 |
| 105 | 73 | 78 |
| 99 | 96 | 73 |
| 95 | 103 | 102 |
| 55 | 82 | 77 |
| 59 | 100 | 102 |
| 81 | 51 | 89 |
| 83 | 76 | 41 |
| 48 | 70 | 73 |
| 56 | 101 | 104 |
| 76 | 81 | 93 |
| 105 | 63 | 69 |
| 105 | 49 | 78 |
| 80 | 97 | 98 |
| 80 | 61 | 87 |
| 67 | 83 | 91 |
| 52 | 45 | 56 |
| 92 | 52 | 49 |
|  | 42 | 47 |
|  | 54 | 49 |
|  | 80 |  |
|  | 62 |  |
|  | 59 |  |

Based on your answer in **(b)**,

* 1. how many treatments involved in this experiment? How many replications involve in each treatment?

**ANSWER: -**

* **Treatment** = 3
  + Computer
  + Construction
  + Engineering
* **Replications:**
  + 30 replications for computer
  + 35 replications for construction
  + 32 replications for engineering
  1. at a significance level of 1%, test for any significant difference in the mean annual salary among the three job fields. Use *Microsoft Excel* and P-value approach to solve this problem.

**ANSWER: -**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Anova: Single Factor | |  |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |  |
| *Groups* | *Count* | *Sum* | *Average* | *Variance* |  |  |
| Computer | 30 | 2443 | 81.43333 | 303.2195 |  |  |
| Construction | 35 | 2634 | 75.25714 | 410.9613 |  |  |
| Engineering | 32 | 2416 | 75.5 | 373.4839 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Between Groups | 762.0095 | 2 | 381.0047 | 1.042814 | 0.356503 | 4.838336 |
| Within Groups | 34344.05 | 94 | 365.3623 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 35106.06 | 96 |  |  |  |  |