CONFIDENTIAL / SULIT

UNIRAZAK
UNIVERSITI TUN ABDUL RAZAK

FINAL EXAMINATION

MARCH 2023

COURSE TITLE	**INTRODUCTION TO BUSINESS STATISTICS**
COURSE CODE	**RMAT1123**
DATE/DAY	**21 JUNE 2023 / WEDNESDAY**
TIME/DURATION	**05:00 PM - 07:00 PM / 02 Hour(s) 00 Minute(s)**

INSTRUCTIONS TO CANDIDATES :

1. Please read the instruction under each section carefully.
2. Candidates are reminded not to bring into examination hall/room any form of written materials or electronic gadget except for stationery that is permitted by the Invigilator.
3. Students who are caught breaching the Examination Rules and Regulation will be charged with an academic dishonesty and if found guilty of the offence, the maximum penalty is expulsion from the University.

(This Question Paper consists of 7 Printed Pages including front page)

DO NOT OPEN THE QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO

This question paper consists of TWO (2) sections. Answer ALL questions in the answer booklet provided. **[100 MARKS]**

SECTION A **(15 Marks)**

There are TWO (2) questions in this section. Answer ALL questions in the answer booklet provided.

QUESTION 1 **(10 Marks)**

State whether the statement below is TRUE or FALSE.

a) Census is a summary measure calculated from population data. (1 mark)

b) Sample is a subset of items that are chosen from the population. (1 mark)

c) Continuous data is obtained through measuring process. (1 mark)

d) Secondary data is data obtained by the researcher himself and expensive to conduct. (1 mark)

e) Stratified sampling requires researcher to divide population into several mutually exclusive strata and samples are randomly taken from each stratum. (1 mark)

f) Number of patients with blood O type is an example of qualitative variable. (1 mark)

g) Percentile is a descriptive measures that split the ordered data into 10 equal parts. (1 mark)

h) Weight of students is an example of discrete random variable. (1 mark)

i) Non-sampling error is an error caused by human factor and not by sampling technique. (1 mark)

j) Number stated on football jersey is an example of ordinal level of measurement. (1 mark)

QUESTION 2 **(5 Marks)**

Explain **TWO (2)** advantages and disadvantages of any data collection method.

SECTION B **(85 Marks)**

There are EIGHT (8) questions in this section. Answer ALL questions in the answer booklet provided.

QUESTION 1 **(10 Marks)**

The data in Table 1 shows the statistics on employed graduates by sector for the year 2020. Construct a pie chart to represent the data given.

Sector	Number of employed graduates
Agriculture	77 800
Mining and query	44 600
Manufacturing	637 500
Construction	228 000
Services	3 365 200

Table 1

QUESTION 2 **(10 Marks)**

Arman goes to work using all of these three modes of transportation: car, motorcycle and train. The probability that he goes by car, motorcycle and train are 4/7, 1/7, 2/7 respectively. The probability that he arrives late if he goes by car, motorcycle and train are 1/5, 1/6 and 2/3.

a) Draw a tree diagram for the scenario above and define the event. (2 marks)

b) What is the probability that Arman arrives early given he drives his car to work? (2 marks)

c) Arman arrives early. By using Bayes' theorem, what is the probability that he went to work by motorcycle? (3 marks)

d) Arman arrives late. By using Bayes' theorem, what is the probability that he went to work by train? (3 marks)

QUESTION 3 **(10 Marks)**

The two-way frequency table below shows data on the number of respondents and relation between smoking habit and health.

	Non-smoker (N)	Moderate smoker (M)	Heavy smoker (H)	Total
Hypertension (T)	21	36	30	87
No hypertension (T')	48	26	19	93
Total	69	62	49	180

Table 2

Based on the data, what is the probability that a random sample selected is (has)

a) a non-smoker, $P(N)$ (2 marks)

b) a moderate smoker with hypertension, $P(M \cap T)$ (2 marks)

c) hypertension given that the respondent is a heavy smoker, $P(T|H)$ (3 marks)

d) no hypertension given that the respondent is a non-smoker, $P(T'|N)$ (3 marks)

QUESTION 4 **(10 Marks)**

Let x be a discrete random variable that follows Binomial distribution with $n = 8$ and $p = 0.3$. By using Binomial formula, find the probability that x is

a) exactly 3 (2 marks)

b) less than or equal to 2 (4 marks)

c) between 4 and 8 (4 marks)

QUESTION 5 **(10 Marks)**

The duration for a person who owns a mobile phone follows normal distribution with a mean of 3.2 years and a standard deviation of 0.56 year. Find the probability that an owner of a mobile phone has been using the gadget for

a) more than 3.5 years (5 marks)

b) between 2 to 3.5 years (5 marks)

QUESTION 6 **(10 Marks)**

Given that the mean and variance for a normal distribution are 2 and 16 respectively. Find the value of x given that

a) $P(z \geq z) = 0.0749$ (5 marks)

b) $P(z \geq -z) = 0.8962$ (5 marks)

QUESTION 7 **(10 Marks)**

Consider a null hypothesis of $H_0: \mu = 120$. A random sample of 40 observations is taken from a population derives a mean of 105.37 with population standard deviation of 32.17. By using 0.05 significant level, conduct a test on the hypothesis and conclude your result.

QUESTION 8 **(15 Marks)**

A researcher wants to study the relationship between number of hours spent on studying and Statistics exam score. Table 3 shows the data on number of hours studied and Statistics exam score for December 2021 on 10 randomly selected students.

Number of hours studied (x)	Statistics exam score (y)
6	82
2	63
1	57
5	88
2	68
3	75
4	72
2	59
3	57
7	76

Table 3

a) Compute Pearson's correlation coefficient and comment on the result obtained. (7 marks)

b) By using least square method, find the linear regression equation for Statistics exam score (y) on number of hours studied (x). (8 marks)

***** END OF QUESTION PAPER *****

List of formula

Law of addition
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Law of addition for mutually exclusive event
$P(A \cup B) = P(A) + P(B)\ if\ A \cap B \neq \emptyset$

Law of multiplication
$P(B \cap A) = P(B|A)P(A)$

Law of multiplication for independent event
$P(B \cap A) = P(A)P(B)$

Conditional event
$$P(B|A) = \frac{P(B \cap A)}{P(A)}$$

Baye's Theorem
$$P(A_1|B) = \frac{P(A_1)P(B|A_1)}{P(A_1)P(B|A_1) + P(A_2)P(B|A_2)}$$

Poisson distribution
$$P(x) = \frac{\mu^x \times e^{-\mu}}{x!}$$

Binomial distribution
$P(x) = nCx\ p^x q^{n-x}$

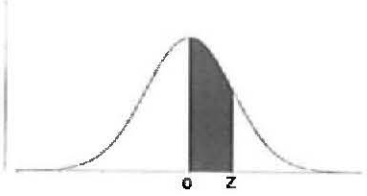
Normal distribution
$$z = \frac{x - \mu}{\sigma}$$
$$x = z\sigma + \mu$$

Test statistics, z
$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$$

Pearson correlation coefficient
$$= \frac{\sum xy - \frac{\sum x \sum y}{n}}{\sqrt{\left[\sum x^2 - \frac{(\sum x)^2}{n}\right]\left[\sum y^2 - \frac{(\sum y)^2}{n}\right]}}$$

Linear regression line
$$b = \frac{\sum xy - \frac{(\sum x)(\sum y)}{n}}{\sum x^2 - \frac{(\sum x)^2}{n}}$$
$$a = \frac{\sum y}{n} - b\left(\frac{\sum x}{n}\right)$$

Standard Normal (Z) Table
Area between 0 and z



z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0	0	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3304	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.483	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990