



**FINAL EXAMINATION**

**COURSE : INTRODUCTION TO STATISTICS AND DATA ANALYSIS**

**COURSE CODE : TQM1063**

**DURATION : 2 HOURS**

**INSTRUCTIONS TO CANDIDATES :**

1. This question paper consists of **FIVE (5)** questions.
2. Answer ALL questions in the Answer Booklet provided.
3. Please check to make sure that this examination pack consists of :
  - i. The Question Paper
  - ii. An Answer Booklet
  - iii. Appendix 1
  - iv. Appendix 2
4. Do not bring any material into the examination hall unless permission is given by the invigilator.
5. Scientific calculator is allowed.
6. Please write your answer using a ball-point pen.

**MYKAD NO :** \_\_\_\_\_

**ID. NO. :** \_\_\_\_\_

**LECTURER :** \_\_\_\_\_

**SECTION :** \_\_\_\_\_

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**DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO**

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*The question paper consists of 3 printed pages*

MAR2024/A/TQM1063

**Short Answer****1. (12 points)**

Table 1 presents the findings of a study conducted among college students on their social media accounts.

	Facebook (FB)	Instagram (IG)	Tik Tok (TT)
Male (M)	80	110	155
Female (F)	85	120	200

Table 1

Suppose a student is randomly selected.

- a. Find the probability that the student
  - i. is a male and has a Facebook account. (1 point)
  - ii. is a female or has a Tik Tok account. (2 points)
  - iii. has an Instagram account given he is a male. (3 points)
- b. Are the events “Female” and “Facebook” mutually exclusive? (2 points)
- c. Illustrate the information in Table 1 into a probability tree. (4 points)

**2. (9 points)**

Adam works in an automotive tire factory. The number of blemished tires (X) that he produces on a random day has the probability distribution as shown in Table 2.

Number of blemished tire, X	2	3	4	5
Probability, P(X)	0.48	0.36	z	0.04

Table 2

- a. Find the value of z. (2 points)
- b. Find the probability that Adam will produce more than three blemished tires tomorrow. (2 points)
- c. Calculate the mean number of blemished tire that Adam produces on a random day. (2 points)
- d. Calculate the variance for the number of blemished tire that Adam produces on a random day. (3 points)

**3. (12 points)**

- a. Determine the following probabilities for the standard normal distribution.
  - i.  $P(-1.15 \leq Z \leq 0)$ . (1 point)
  - ii.  $P(0 \leq Z \leq 2.63)$ . (1 point)

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- b. Susan uses her mobile phone for  $X$  minutes each day.  $X$  is a random variable which may be modelled by a normal distribution with mean 24 minutes and standard deviation 8 minutes. Find the probability that on a particular day Susan uses her mobile phone for
- i. more than 36 minutes. (3 points)
  - ii. at most 34 minutes. (3 points)
  - iii. between 26 and 30 minutes. (4 points)

**4. (4 points)**

A random sample of 114 pregnant smokers was chosen by the researchers in order to examine the possible relationship between smoking during pregnancy and premature births. The average pregnancy length for this sample of smokers was 260 days and standard deviation of 16 days.

- a. Find the point estimate of the population mean. (1 point)
- b. Calculate a 95% confidence interval of the population mean. (3 points)

**5. (13 points)**

- a. State the null and alternative hypothesis for the following statement. Hence, determine whether it is left-tailed, right-tailed or two tailed test.
  - i. An architect estimates that the average height of buildings in his city is less than 250 meters. (2 points)
  - ii. Malaysia experienced an average of more than 1,573 number of accidents per day in 2024. (2 points)
- b. A study found that the average expenses of the Gemilang college students' mall outing was more than RM110. In order to verify the claims, the researcher selected 50 students at random from Gemilang college. The average cost of their spending was discovered to be RM120, with a standard deviation of RM23. At  $\alpha = 0.05$ , is there enough evidence to support the claims.
  - i. State the null and alternative hypothesis. (2 points)
  - ii. State the type of the test. (1point)
  - iii. Find the critical value. (1 point)
  - iv. Calculate the statistical test. (3 points)
  - v. State the decision. (1 point)
  - vi. Sate the conclusion. (1 point)

**END OF QUESTION PAPER**

## APPENDIX 1

**Probability Theory and Probability Distribution**

i. Addition rule:  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

ii. Multiplication rule:

$$P(A \cap B) = P(B) \cdot P(A | B)$$

$$P(A \cap B) = P(A) \cdot P(B) \text{ if and only if } A \text{ and } B \text{ are independent events}$$

iii. Conditional probability:  $P(A | B) = \frac{P(A \cap B)}{P(B)}$

iv. Mean for a probability distribution:  $\mu = E(x) = \sum x \cdot p(x)$

v. Variance for a probability distribution:  $Var(x) = \sum x^2 P(x) - [E(x)]^2$

**Normal Distribution**

i. Standardized score:  $z = \frac{x - \mu}{\sigma}$

**Estimation of mean**

Margin of error for the point estimation of  $\mu$ :  $Z_{\alpha/2} \left( \frac{\sigma}{\sqrt{n}} \right)$

i. Confidence interval of  $\mu$  for a large sample

$$\bar{x} - z \frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z \frac{\sigma}{\sqrt{n}}$$

or

$$\bar{x} - z \frac{s}{\sqrt{n}} < \mu < \bar{x} + z \frac{s}{\sqrt{n}}$$

ii. Minimum sample size needed for an interval estimate of the population mean:

$$n = \left( \frac{Z_{(\alpha/2)} \cdot \sigma}{E} \right)^2$$

**Hypothesis Testing**

i. z test:  $z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

## APPENDIX 2

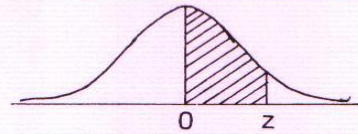
Table 4

## NORMAL DISTRIBUTION

## Statistical Table

The following table gives the areas under the standard normal curve from 0 to z

Eg:  $P(0 \leq z \leq 1.24) = 0.3925$



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000