UNIVERSITI PERTAHANAN MALAYSIA
UPTM

FINAL EXAMINATION

BACHELOR OF INFORMATION TECHOLOGY (HONOURS) IN COMPUTER APPLICATION DEVELOPMENT
BACHELOR OF INFORMATION TECHNOLOGY (HONOURS) IN CYBER SECURITY
BACHELOR IN INFORMATION TECHOLOGY (HONOURS) (DATA ANALYTICS)
BACHELOR IN COMPUTER SCIENCE (HONOURS)

COURSE	:	**STATISTICS AND PROBABILITY/ STATISTICS**
COURSE CODE	:	**STA2133/STA2103**
DURATION	:	**3 HOURS**

INSTRUCTIONS TO CANDIDATES:

1. This question paper consists of **FOUR (4)** 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(1) and 1(2)
   iv. Appendix 2
4. Do not bring any material into the examination hall. Electronic calculator is allowed.
5. Please write your answer using permanent ink.

MYKAD/ PASSPORT NO. : _____

ID. NO. : _____

LECTURER : _____

SECTION : _____

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

This question paper consists of 5 printed pages including the front page

QUESTION 1

a. At SkyCafe Co., the variable X represents the number of takeaway coffee orders received during the lunch hour on a randomly selected weekday. The probability distribution for X is given as follows: for 20 orders, the probability is 10%; for 30 orders, the probability is 20%; for 40 orders, the probability is 30%; for 50 orders, the probability is 25%; and for 60 orders, the probability is 15%. This distribution helps SkyCafe Co. plan staffing and manage inventory efficiently.

i. Create a probability distribution table.

(2 marks)

ii. If a weekday is selected at random, determine the probability that the number of takeaway orders received is at least 50.

(3 marks)

iii. Calculate the mean and standard deviation of the number of takeaway coffee orders during the lunch hour.

(6 marks)

b. At MetroLink Bus Terminal, it is found that 9 out of every 25 buses arrive late during peak hours. For a quality control study, 15 buses are randomly selected.

i. State the name of the probability distribution used for the above variable.

(1 mark)

ii. Find the probability that exactly 6 of the selected buses arrive late.

(2 marks)

iii. Calculate the mean and variance of the number of buses that arrive late.

(4 marks)

c. A small coffee shop tracks the number of customers ordering coffee in the morning rush. On average, 8 customers place an order per 30 minutes. For any given 30 minutes, find the probability that the number of customers placing an order is:

i. exactly 4 customers.

(2 marks)

ii. between 6 and 8 customers, inclusive.

(5 marks)

(Total: 25 marks)

QUESTION 2

a. During a National Technology Innovation Hackathon, the number of teams that successfully complete all required challenges within the allocated time is recorded. The random variable X, representing the number of teams that complete the hackathon, is normally distributed with a mean of 89 teams and a standard deviation of 8 teams. Find the probability that, for a randomly selected hackathon, the number of teams that successfully complete all challenges is:

i. more than 95 teams.

(4 marks)

ii. between 70 and 90 teams.

(7 marks)

b. In a social media behavior study, the daily time (in minutes) that teenagers spend on TikTok follows a normal distribution with a mean of 120 minutes and a standard deviation of 20 minutes. A random sample of 49 teenagers is selected.

i. Calculate the standard deviation of the sampling distribution.

(3 marks)

ii. Find the probability that the sample mean daily usage is more than 124.3 minutes.

(4 marks)

iii. Find the probability that the sample mean daily usage lies between 114.2 minutes and 119.2 minutes.

(7 marks)

(Total: 25 marks)

QUESTION 3

a. A music streaming service aims to estimate the average number of minutes students spend streaming music each day. A random sample of 49 students reports a mean of 95 minutes per day, with a sample standard deviation of 21 minutes.

i. Determine the best point estimate of the population mean daily streaming time.
(2 marks)

ii. Construct a 95% confidence interval for the population mean daily streaming time.
(6 marks)

iii. The company wishes to estimate the mean daily streaming time with a margin of error not exceeding 4 minutes at a 99% confidence level. Determine the minimum required sample size.
(4 marks)

b. In a study on cashless payment behavior among university students, data were collected from 400 students. Among them, 260 reported that they prefer using e-wallets (such as Touch 'n Go, GrabPay or Boost) instead of cash for daily transactions. The study aims to examine the adoption of digital payment methods among students.

i. Calculate the best point estimate of the population proportion of students who prefer using e-wallets over cash.
(2 marks)

ii. Construct a 90% confidence interval for the true proportion of students who prefer using e-wallets over cash. Interpret the interval obtained.
(7 marks)

iii. The researcher wishes to determine the required sample size to estimate the population proportion with a 95% confidence level and a maximum margin of error of 5%. Determine the minimum sample size required.
(4 marks)

(Total: 25 marks)

QUESTION 4

a. Write the null and alternative hypothesis for each of the following statements.

i. The organizers of an online gaming tournament want to test whether the average score of players in a new game mode is lesser than 80 points.

(2 marks)

ii. A city wants to test whether the average distance traveled per e-scooter trip is at least 10 km after implementing new traffic regulations.

(2 marks)

b. A social media app wants to test whether introducing a "daily screen time limit" feature decreases the average number of hours users spend on the app per day. Previously, users spent an average of 3 hours per day. After introducing the feature, a random sample of 28 users shows a mean of 2.5 hours per day, with a standard deviation of 0.7 hour. At a 1% significance level, can we conclude that the new feature decreases the average daily screen time?

i. State the null and alternative hypothesis.

(2 marks)

ii. Determine the critical value for $\alpha = 0.01$.

(2 marks)

iii. Compute the test statistics.

(3 marks)

iv. State the decision and conclusion for the above study.

(4 marks)

c. A fast-food chain claimed that more than 6% of its customers received wrong orders during lunchtime. A random sample of 220 customers found that 33 received wrong orders. At a significance level of $\alpha = 0.05$, conduct a hypothesis test to determine whether the proportion of wrong orders is more than 6%.

(10 marks)

(Total: 25 marks)

(TOTAL: 100 MARKS)

END OF QUESTION PAPER

APPENDIX 1(1)

Discrete Probability Distribution

1. Discrete random variable
   a. $\mu = \sum xP(x)$
   b. $\sigma^2 = \sum x^2 P(x) - \mu^2$

2. Binomial Distribution
   a. $P(X = r) = {}^nC_r p^r q^{n-r}$
   b. $\mu = np$
   c. $\sigma^2 = npq$

3. Poisson Distribution
   a. $P(X = k) = \frac{\lambda^k e^{-\lambda}}{k!}$
   b. $\mu = \sigma^2 = \lambda$

Normal Distribution

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

Sampling Distribution

1. Mean of $\bar{x}$: $\mu_{\bar{x}} = \mu$
2. Standard deviation of $\bar{x}$: $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$
3. z value for $\bar{x}$: $z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

Estimation of mean

1. Margin of error for the point estimation of μ : $\pm Z\frac{\sigma}{\sqrt{n}}$
2. Confidence interval μ for a large sample

$$\mu = \bar{x} \pm Z\frac{\sigma}{\sqrt{n}} \quad \text{or} \quad \mu = \bar{x} \pm Z\frac{s}{\sqrt{n}}$$

3. Minimum sample size required of the population mean:

$$n = \left(\frac{z\sigma}{E}\right)^2$$

APPENDIX 1 (2)

Estimation of proportion

1. Margin of error for the point estimation of p: $\pm Z\sqrt{\frac{\hat{p}\,\hat{q}}{n}}$

2. Confidence interval p for a large sample

$$\hat{p} \pm Z\sqrt{\frac{\hat{p}\hat{q}}{n}}$$

3. Minimum sample size required of the population proportion:

$$n = \frac{Z^2 pq}{E^2}$$

Hypothesis testing

1. Test statistics for mean $= \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}$

2. Test statistics for proportion $= \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$

APPENDIX 2

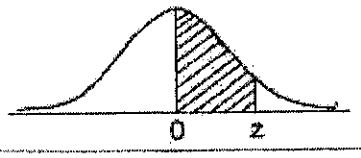
Table

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	.0848	.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	.4998	.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