CONFIDENTIAL

UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET

COURSE CODE	:	FGE 1133
COURSE	:	BASIC STATISTICS
SEMESTER/SESSION	:	3-2023/2024(SEPTEMBER INTAKE)
DURATION	:	3 HOURS

Instructions:

1. This booklet contains 5 questions in SECTION A and 6 questions in SECTION B. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 9 PRINTED PAGES INCLUDING COVER PAGE

SECTION A (50 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

Given a sample mass, in kg, of nine randomly chosen dragon fruits as follows,

0.16, 0.68, 0.70, 0.57, 0.82, 0.70, 0.38, 0.49, 0.53

Calculate the mode, mean and median. (4 marks)

QUESTION 2

The table below shows the number of bouquets that were bought by a population of 80 parents during the recent convocation's day at Mutiara College.

Number of Flowers	Frequency
1 – 4	5
5 – 8	13
9 – 12	31
13 – 16	19
17 – 20	8
21 – 24	4

a) Calculate the mean and median of the data. (7 marks)

b) Calculate the standard deviation of the data. (5 marks)

c) Compute the Pearson Coefficient Skewness and interpret the distribution for the value obtained. (3 marks)

QUESTION 3

A chocolate factory polls its customer on their favourite flavor. Let event C be the customer prefers chocolate flavor and event V be the customer prefers vanilla flavor. Suppose that $P(C)=0.51$, $P(V)=0.27$ and $P(C\cap V)=0.15$.

a) Find $P(C|V)$. (3 marks)

b) Are event C and V mutually exclusive? (3 marks)

c) Are event C and V independent? (2 marks)

QUESTION 4

A random variable has the following probability distribution:

x	0	1	2	3	4	5
$P(X=x)$	a	0	$3a$	$4a$	$4a^2$	$6a^2+a$

Based on the table, calculate:

a) the value of a (3 marks)

b) $P(2 \leq X < 5)$ (2 marks)

c) $E(X)$ (2 marks)

d) $Var(X)$ (4 marks)

QUESTION 5

The mass of people who comes to ride a cable car has a normal distribution with mean and standard deviation of 55 kg and 2.2 kg, respectively.

a) Find the probability of a random person selected who is:

i) less than 58 kg, (3 marks)

ii) between 51 kg and 57.5 kg. (4 marks)

b) Given that 37% of the people who come to ride the cable car are less than q kg. Find the value of q. (5 marks)

SECTION B (50 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

A market research company has studied the quality of after-sales service provided by 132 electrical retailers in a region. The findings are summarized as below:

	Good service	Poor service
High street chain	51	27
Independent retailer	39	15

If a retailer is selected at random, calculate the probability that the retailer:

a) provides poor service, (1 mark)

b) is independent and provides good service, (1 mark)

c) is a high street chain or provides good service, (2 marks)

d) provides poor service given that the selected retailer is part of a high street chain. (3 marks)

QUESTION 2

The weight of male students of a certain college are collected and recorded as a set, $S = \{78, 86, 82, 90\}$. Random sample of size two is taken without replacement.

a) Compute the population mean and the population standard deviation. (5 marks)

b) Find the sampling distribution for the sample mean, $\bar{x}$. (5 marks)

c) Compute the mean for the sampling distribution, $\mu_{\bar{x}}$ and the standard deviation for the sampling distribution, $\sigma_{\bar{x}}$. (3 marks)

d) Compare the value that you get in (c) with the population mean and the population standard deviation. (2 marks)

QUESTION 3

At a certain airfield planes land at random times at a constant average rate of one every 10 minutes.

a) Find the probability that exactly 5 planes will land in a period of 20 minutes. (2 marks)

b) Find the probability that at least 2 planes will land in a period of one hour. (3 marks)

c) Calculate the mean and variance of the planes land in a period of 45 minutes. (2 marks)

QUESTION 4

In a survey, 68% of students in Malaysia are short-sighted. A random sample pf 160 students was selected from a school in Malaysia and 122 were found to be short-sighted. Test whether the school contains a different proportion of short-sighted students in Malaysia as a whole using 1% significance level. (8 marks)

QUESTION 5

A doctor claims that the mean age of patients diagnosed with high blood pressure at his clinic is more than 44 years. The mean age of a random sample of 36 patients with high blood pressure at his clinic is 45.6 years. Given the population standard deviation of the ages of the patients is 5 years. Perform a complete hypothesis test at 5% significance level, to determine whether the doctor's claim is true. (8 marks)

QUESTION 6

It is known that 37% of the students at a college do not take breakfast regularly. A random sample of 200 students is chosen. Use normal approximation to calculate the probability that there are more than 82 students who do not take breakfast regularly. (5 marks)

---------------------------------------**END OF QUESTION**---------------------------------------

FORMULA

1. Mean, $\overline{x} = \dfrac{\sum_{i=1}^{n} x_i}{n}$ or $\overline{x} = \dfrac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$

2. Median, $x = L_m + \left[\dfrac{\dfrac{\sum f}{2} - \sum f_{m-1}}{f_m} \right] \times C_m$

3. Mode, $x = L_{mo} + \left[\dfrac{d_1}{d_1 + d_2} \right] \times C_{mo}$

4. Variance, $s^2 = \dfrac{1}{n-1}\left(\sum x_i^2 - \dfrac{\left(\sum x_i\right)^2}{n} \right)$ or $s^2 = \dfrac{1}{\sum f - 1}\left(\sum f_i x_i^2 - \dfrac{\left(\sum f_i x_i\right)^2}{\sum f} \right)$

5. $Q_1 = L_{Q1} + \left[\dfrac{\frac{1}{4}N - F_{Q1}}{f_{Q1}} \right] \times C$ and $Q_3 = L_{Q3} + \left[\dfrac{\frac{3}{4}N - F_{Q3}}{f_{Q3}} \right] \times C$

6. Skewness $= \dfrac{\text{mean} - \text{mode}}{\text{standard deviation}}$ or Skewness $= \dfrac{3(\text{mean} - \text{median})}{\text{standard deviation}}$

where

$n = \sum f$	: Total frequency
L_m	: Lower bound of median class
L_{mo}	: Lower bound of modal class
L_{Q1}	: Lower boundary of the class in which the first quartile lies.
f_m	: Frequency of median class
$\sum f_{m-1}$	: Cumulative frequency before the median class
C_m	: Size of the median
C_{mo}	: Size of the modal class
d_1	: Difference between modal class frequency and the previous class frequency
d_2	: Difference between modal class frequency and the next class frequency

7. $P(A)=\dfrac{n(A)}{n(S)}$

8. $P(A\mid B)=\dfrac{P(A\cap B)}{P(B)}$

9. $P(A\cup B)=P(A)+P(B)-P(A\cap B)$

10. $\mu=\dfrac{\sum x}{N}$

11. $\mu_{\bar{x}}=\sum \bar{x}P(\bar{x})$

12. $\sigma=\sqrt{\dfrac{\sum(x_i-\mu)^2}{N}}$

13. $\sigma_{\bar{x}}=\dfrac{\sigma}{\sqrt{n}}$ or $\sigma_{\bar{x}}=\dfrac{\sigma}{\sqrt{n}}\sqrt{\dfrac{N-n}{N-1}}$

14. $\mu_{\hat{p}}=p$

15. $\sigma_{\hat{p}}=\sqrt{\dfrac{pq}{n}}$

16. $Z=\dfrac{\bar{x}-\mu_0}{\dfrac{\sigma}{\sqrt{n}}}$

17. $Z=\dfrac{(\bar{x}_1-\bar{x}_2)-(\mu_1-\mu_2)}{\sqrt{\dfrac{\sigma_1^{\ 2}}{n_1}+\dfrac{\sigma_2^{\ 2}}{n_2}}}$

18. $Z=\dfrac{\hat{p}-p_0}{\sqrt{\dfrac{p_0(1-p_0)}{n}}}$, $\hat{p}=\dfrac{x}{n}$

19. $Z=\dfrac{\hat{p}_1-\hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\dfrac{1}{n_1}+\dfrac{1}{n_2}\right)}}$, $\hat{p}=\dfrac{x_1+x_2}{n_1+n_2}$

20. $\sum_{-\infty}^{\infty} f(x)=1$ or $\int_{-\infty}^{\infty} f(x)\ dx=1$

21. $E(X)=\sum_{-\infty}^{\infty} x\cdot f(x)=\int_{-\infty}^{\infty} x\cdot f(x)\ dx$

22. $E(X^2)=\sum_{-\infty}^{\infty} x^2\cdot f(x)=\int_{-\infty}^{\infty} x^2\cdot f(x)\ dx$

23. $Var(X)=E(X^2)-[E(X)]^2$

24. $P(X=x)=\binom{n}{x}p^x q^{n-x}\quad x=0,1,..,n$

25. $P(X=x)=\dfrac{\lambda^x e^{-\lambda}}{x!}\quad x=0,1,..$

26. $Z=\dfrac{X-\mu}{\sigma}$

27. $X\sim Bin(n,p)\to X\sim N(np,npq)$

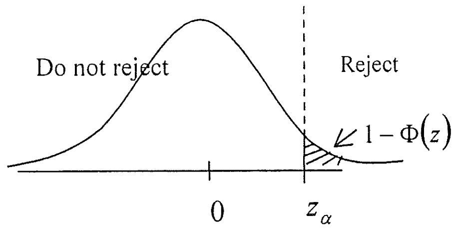
28. $X\sim Poi(\lambda)\to X\sim N(\lambda,\lambda)$

APPENDIX I

Table I Standard Normal Distribution

$$1-\Phi(z)=P(Z>z)=\frac{1}{\sqrt{2\pi}}\int_{z}^{\infty}e^{-z^2/2}dz$$

$$z=\frac{x-\mu}{\sigma}$$



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.0	.02275	.02222	.02169	.02118	.02068	.02018	.01970	.01923	.01876	.01831
2.1	.01786	.01743	.01700	.01659	.01618	.01578	.01539	.01500	.01463	.01426
2.2	.01390	.01355	.01321	.01287	.01255	.01222	.01191	.01160	.01130	.01101
2.3	.01072	.01044	.01017	.00990	.00964	.00939	.00914	.00889	.00866	.00842
2.4	.00820	.00798	.00776	.00755	.00734	.00714	.00695	.00676	.00657	.00639
2.5	.00621	.00604	.00587	.00570	.00554	.00539	.00523	.00508	.00494	.00480
2.6	.00466	.00453	.00440	.00427	.00415	.00402	.00391	.00379	.00368	.00357
2.7	.00347	.00336	.00326	.00317	.00307	.00298	.00289	.00280	.00272	.00264
2.8	.00256	.00248	.00240	.00233	.00226	.00219	.00212	.00205	.00199	.00193
2.9	.00187	.00181	.00175	.00169	.00164	.00159	.00154	.00149	.00144	.00139
3.0	.00135	.00131	.00126	.00122	.00118	.00114	.00111	.00107	.00104	.00100
3.1	.00097	.00094	.00090	.00087	.00084	.00082	.00079	.00076	.00074	.00071
3.2	.00069	.00066	.00064	.00062	.00060	.00058	.00056	.00054	.00052	.00050
3.3	.00048	.00047	.00045	.00043	.00042	.00040	.00039	.00038	.00036	.00035
3.4	.00034	.00032	.00031	.00030	.00029	.00028	.00027	.00026	.00025	.00024
3.5	.00023	.00022	.00022	.00021	.00020	.00019	.00019	.00018	.00017	.00017
3.6	.00016	.00015	.00015	.00014	.00014	.00013	.00013	.00012	.00012	.00011
3.7	.000108	.000104	.000100	.000096	.000092	.000088	.000085	.000082	.000078	.000075
3.8	.000072	.000069	.000067	.000064	.000062	.000059	.000057	.000054	.000052	.000050
3.9	.000048	.000046	.000044	.000042	.000041	.000039	.000037	.000036	.000034	.000033
4.0	.000032									

$5.0 \rightarrow 0.0000002867$ $5.5 \rightarrow 0.0000000190$ $6.0 \rightarrow 0.0000000010$

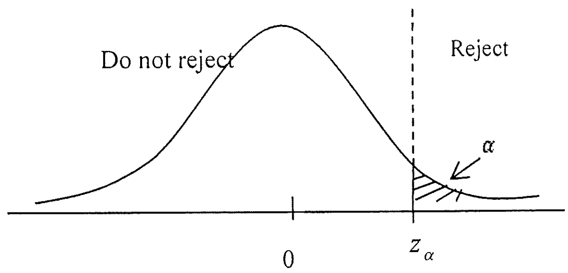
APPENDIX II

Table II Percentage Points of the Normal Distribution

The table gives the 100α percentage points, z_α of a standardised normal distribution where

$$\alpha = \frac{1}{\sqrt{2\pi}} \int_{z_\alpha}^{\infty} e^{-z^2/2} dz$$

Thus z_α is the value of a standardised normal variate which has probability α of being exceeded.



α	z_α	α	z_α	α	z_α	α	z_α	α	z_α	α	z_α
.50	0.0000	.050	1.6449	.030	1.8808	.020	2.0537	0.010	2.3263	.050	1.6449
.45	0.1257	.048	1.6646	.029	1.8957	.019	2.0749	.009	2.3656	.010	2.3263
.40	0.2533	.046	1.6849	.028	1.9910	.018	2.0969	.008	2.4089	.001	3.0902
.35	0.3853	.044	1.7060	.027	1.9268	.017	2.1201	.007	2.4573	.0001	3.7190
.30	0.5244	.042	1.7279	.026	1.9431	.016	2.1444	.006	2.5121	.00001	4.2649
.25	0.6745	.040	1.7507	.025	1.9600	.015	2.1701	.005	2.5758	.025	1.9600
.20	0.8416	.038	1.7744	.024	1.9774	.014	2.1973	.004	2.6521	.005	2.5758
.15	1.0364	.036	1.7991	.023	1.9954	.013	2.2262	.003	2.7478	.0005	3.2905
.10	1.2816	.034	1.8250	.022	2.0141	.012	2.2571	.002	2.8782	.00005	3.8906
.05	1.6449	.032	1.8522	.021	2.0335	.011	2.2904	.001	3.0902	.000005	4.4172