CONFIDENTIAL

UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: FGE 1133
COURSE	: BASIC STATISTICS
SEMESTER/SESSION	: 2-2022/2023(INTAKE JULY)
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

The number of books borrowed from the library from the selected students are as follows:

0,0,0,1,2,3,3,4,4,5,5,7,7,7,7,8,8,8,9,10,10,11,11,12,12.

Find the mean and the mode, hence interpret each value obtained. (5 marks)

QUESTION 2

Table 1 shows the distribution of the monthly cost spent by 60 college students on a cell phone application store.

Table 1

Monthly cost on application store	Number of students
10 – 19	8
20 – 29	16
30 – 39	21
40 – 49	11
50 – 59	4

Based on Table 1:

a) Calculate the mean and median for the group data of college students. (7 marks)

b) Calculate the standard deviation for the monthly cost spent by the group. (5 marks)

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

QUESTION 3

Let event $C =$ taking an English class and event $D =$ taking a speech class. Suppose $P(C) = 0.75$, $P(D) = 0.3$, $P(C \mid D) = 0.75$ and $P(C \cap D) = 0.225$.

Classify your answers to the following questions numerically.

a) Are C and D independent? (3 marks)

b) Are C and D mutually exclusive? (2 marks)

c) What is $P(D \mid C)$? (3 marks)

QUESTION 4

A random variable has the following probability distribution:

x	0	1	2	3
$P(X = x)$	0.4	0.3	0.2	0.1

Based on the table, find:

a) $P(X \geq 1)$ (2 marks)

b) $P(0 < X \leq 2)$ (2 marks)

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

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

QUESTION 5

The distance, in kilometers, travelled to work by the employees of a city council may be modelled by a normal distribution with mean 7.5 and standard deviation 2.5. Find the probability that the distance travelled to work by a selected employee is:

a) Less than 10.0 km. (3 marks)

b) Between 5.5 km and 10.5 km. (4 marks)

c) 5% of the employees travelled more than h km to work. Find the value of h.

(5 marks)

SECTION B (50 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

Suppose a study of speeding violations and drivers who use cell phones produced the following data:

	Injury in last year	No injury in the last year
Stretches	55	295
Does not streches	231	219

Calculate the following probability using the table given above:

a) Find the probability that athlete stretches before exercising? (1 mark)

b) Find the probability that athlete does not stretches and having injury in the last year? (1 mark)

c) What is the probability athlete stretches before exercising given that no injury in the last year? (3 marks)

d) What is the probability that athlete does not stretches before exercising or does not injury in the last year? (3 marks)

QUESTION 2

A population consists of the set $S = \{68, 70, 72, 74\}$. Random sample of size two is taken with 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

A customer service center receives about ten emails every half-hour. What is the probability that the customer service center receives more than four emails in the next six minutes?
(6 marks)

QUESTION 4

A company claimed that at least 99% of the electronic components that they exports does not have any defects. A sample of 150 electronic components was tested, and 12 were found with defect. Test that the proportion of non-defective components that the company exports is less than 99% at 0.01 level of significance?
(8 marks)

QUESTION 5

A quality control manager claims that the standard mean volume per bottle of dishwasher detergent is 250 milimeter. Ten random samples are taken from a batch and the volume per bottle is measured. The sample mean for the batch selected is 243 milimeter. It is known that the population standard deviation is 7 milimeter. Is this sample mean below the claim value? Test at 0.05 level of significance.
(8 marks)

QUESTION 6

In a large school, 20% of students own a touch screen laptop. A random sample of 225 students is chosen from the school. Using a normal approximation, find the probability that more than 55 of these students owns a touch screen laptop.
(5 marks)

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

FORMULA

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

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

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

4. $s^2 = \dfrac{1}{n-1}\left(\sum x_i^2 - \dfrac{\left(\sum x_i\right)^2}{n} \right)$ 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. $\text{Skewness} = \dfrac{\text{mean-mode}}{\text{standard deviation}}$ or $\text{Skewness} = \dfrac{3(\text{mean-median})}{\text{standard deviation}}$

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

26. $X\sim Bin(n,p)\rightarrow X\sim N(np,npq)$

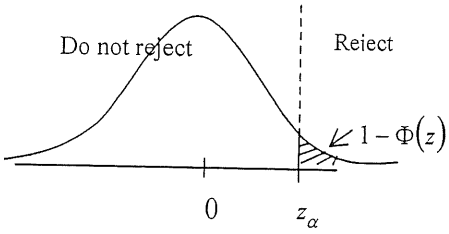
27. $X\sim Poi(\lambda)\rightarrow X\sim N(\lambda,\lambda)$

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									

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

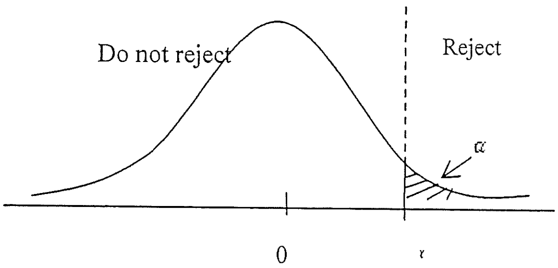
APPENDIX II

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