UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DGE 2133
COURSE	: MATHEMATICS III
SEMESTER/SESSION	: 2-2023/2024
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **5** questions in SECTION A, **3** questions in Section B and **2** questions in SECTION C. 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

a) Figure 1 shows a sector of *AOB* with centre *O*. The length of the arc *AB* is 15 cm and, the perimeter of the sector *AOB* is 39 cm. Find the value of θ in radian.

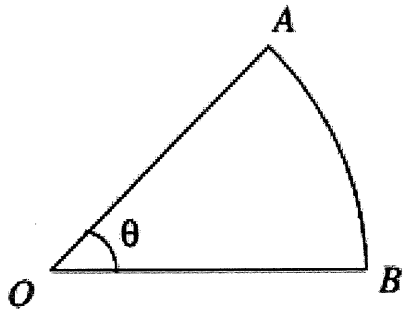


Figure 1

(4 marks)

b) Figure 2 shows a circle with centre *O*. The length of the major arc *RS* is 45 cm. Find the length of the radius.

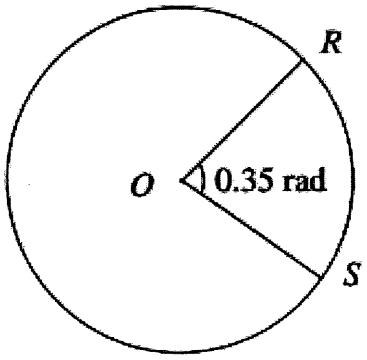


Figure 2

(3 marks)

QUESTION 2

a) Find the sum of the first five terms of the geometric progression $28, 7, \frac{7}{4}, \ldots$.

(3 marks)

b) Find the sum of the first 20 terms of the arithmetic progression $-9, -6, -3, \ldots$.

(3 marks)

QUESTION 3

Table 1 shows the travelling time for 50 workers from their houses to their workplace.

Table 1

Time (minutes)	Number of students
10 – 19	6
20 – 29	9
30 – 39	15
40 – 49	12
50 – 59	8

Find:

a) mean (3 marks)

b) median (4 marks)

c) mode (4 marks)

d) standard deviation. (5 marks)

QUESTION 4

If $X \sim N(200, 625)$, find using the standard normal table, the following probability.

a) $P(X > 250)$ (3 marks)

b) $P(175 < X < 225)$ (4 marks)

c) $P(X < 275)$ (4 marks)

QUESTION 5

a) Construct the region which satisfies the following linear inequalities:

i. $2y > x + 6$ (2 marks)

ii. $3y + 2x \geq 6$ (2 marks)

b) Write down three inequalities which define the shaded region R in Figure 3.

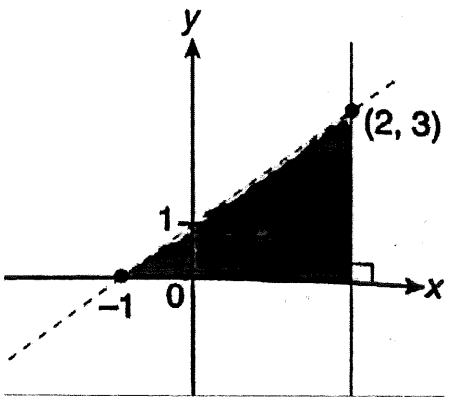


Figure 3

(6 marks)

SECTION B (30 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

The 8^{th} term of an arithmetic progression is 11 and the 15^{th} term is 21. Find the common difference, the first term and the sum of first 20 terms. (8 marks)

QUESTION 2

a) A fair dice is thrown once. Let X be the event when the dice shows 5 and Y be the event when the dice shows an even number.

i. Find the probability that 5 or even number is the outcome. (5 marks)

ii. Are event X and Y mutually exclusive? (2 marks)

b) Box C contains 3 black marbles and 7 yellow marbles. A marble is chosen randomly from box C, its colour is noted and returned to the box. Then a second marble is chosen. Find the probability that

i. both marbles are black. (3 marks)

ii. the two marbles are different colours. (3 marks)

iii. at least one of the balls chosen is yellow. (3 marks)

QUESTION 3

The probability that a student wins a badminton competition is 0.6. If a total of 7 games are played, find the probability that a student will win

a) at least 5 games. (3 marks)

b) not more than 4 games. (3 marks)

SECTION C (20 MARKS)

INSTRUCTION: ANSWER ALL QUESTIONS.

QUESTION 1

Table 2 shows the price indices and percentage of usage of four items, *P*, *Q*, *R*, and *S*, which are the main ingredients in the production of a type of biscuit.

Item	Price index for the year 1995 based on the year 1993	Percentage of usage (%)
P	135	40
Q	*x*	30
R	105	10
S	130	20

Table 2

a) Calculate

i. the price of *S* in the year 1993 if its price in the year 1995 is RM37.70. (2 marks)

ii. the price index of *P* in the year 1995 based on the year 1991 if its price index in the year 1993 based on the year 1991 is 110. (3 marks)

b) The composite index number of the loss of biscuit production for the year 1995 based on the year 1993 is 128. Find the value of *x* (5 marks)

QUESTION 2

a) Figure 4 shows a straight line graph drawn to represent the equation $y = ax + bx^2$. Find the value of a and b.

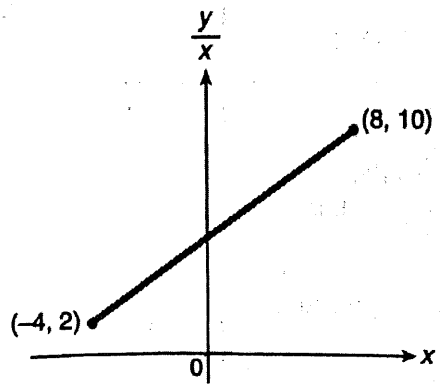


Figure 4

(5 marks)

b) Figure 5 shows a straight line graph to represent the equation $\frac{1}{y} = ax^3 + b$. Find the value of a and b.

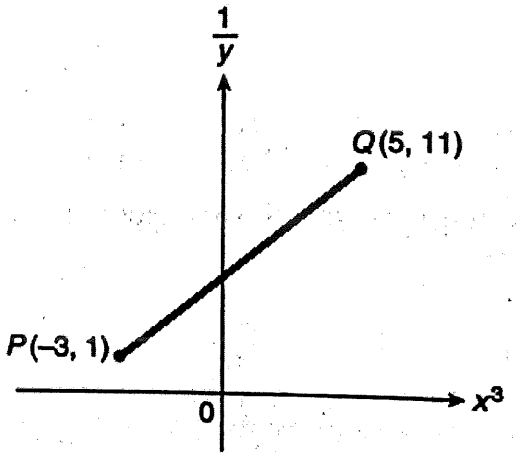


Figure 5

(5 marks)

---------- END OF QUESTIONS ----------

FORMULA

$S = r\theta$ $S = \frac{\theta}{360} \times 2\pi r$	$I = \frac{Q_1}{Q_0} \times 100$ $\bar{I} = \frac{\sum I_i W_i}{\sum W_i}$
$T_n = a + (n-1)d$ $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$ $S_n = \frac{n}{2}(a + l)$, where l= is the last term	$T_n = ar^{n-1}$ $S_n = \frac{a(1-r^n)}{1-r}$
$y = mx + c$ $m = \frac{y_2 - y_1}{x_2 - x_1}$	$P(A) = \frac{n(A)}{n(S)}$
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	$Z = \frac{X - \mu}{\sigma}$
$P(X = x) = {}^nC_x \cdot p^x \cdot q^{n-x}$ $\mu = np$ $\sigma = \sqrt{npq}$	$\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$
$Median, \tilde{x} = L_m + \left[\frac{\frac{\sum f}{2} - \sum f_{m-1}}{f_m}\right] \times C_m$	$Mode, \hat{x} = L_{mo} + \left[\frac{d_1}{d_1 + d_2}\right] \times C_{mo}$
$s^2 = \frac{1}{\sum f - 1}\left(\sum f_i x_i^2 - \frac{(\sum f_i x_i)^2}{\sum f}\right)$ $s = \sqrt{s^2}$	where $n = \sum f$: Total frequency L_m : Lower bound of median class L_{mo} : Lower bound of modal class 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 C : Size 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

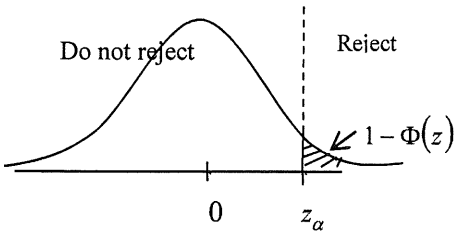
APPENDIX I

Table I Standard Normal Distribution

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

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

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



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									