CONFIDENTIAL

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014

COURSE NAME	:	TECHNICAL MATHEMATICS III
COURSE CODE	:	DAS 21203
PROGRAMME	:	2 DAB, 2 DAR, 2 DAJ
EXAMINATION DATE	:	DECEMBER 2013/JANUARY 2014
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS IN **PART A** AND **THREE (3)** QUESTIONS IN **PART B**

THIS QUESTION PAPER CONSISTS OF **ELEVEN (11)** PAGES

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PART A

Q1 (a) A car service centre has twenty (20) new tyres and eight (8) used tyres for sale. The owner selects two (2) new tyres without replacement.

(i) Given X = number of new tyres, find $P(X=0)$, $P(X=1)$ and $P(X=2)$. Hence fill up the Probability distribution function table below:

x	0	1	2
$P(X=x)$			

(ii) Based on **Q1** (a)(i), find $P(0 \leq X < 2)$ and $V(X)$.

(12 marks)

(b) Given that random variable X have the continuous probability density function $f(x)$ is as below:

$$f(x) = \begin{cases} x, & 0 \leq x < 1 \\ \frac{1}{24}(2x-1), & 1 \leq x \leq 4 \\ 0, & \text{otherwise} \end{cases}$$

Find

(i) $P(0 \leq X \leq 3)$.

(ii) Expected Value, $E(X)$.

(iii) $E(3X-2)$.

(8 marks)

Q2 (a) A coin is tossed seven times. Let X be a random variable for number of head is recorded. Find the probability of getting

(i) exactly three heads.

(ii) at least five heads.

(7 marks)

(b) The number of students late to class per day is two. Find the

(i) probability exactly five students late to class per day.

(ii) mean number of students late to class per week.

(iii) probability at most two per day.

(7 marks)

(c) Suppose that the test scores for the technical mathematics are normally distributed with mean, 72 and standard deviation, 9. What are the probability that the test scores lies between 75 and 80?

(6 marks)

PART B

Q3 (a) If $\boldsymbol{a} = 2\boldsymbol{i} + 3\boldsymbol{j} - 5k$ and $\boldsymbol{b} = -11\ \boldsymbol{i} - 13\boldsymbol{j} + 17\boldsymbol{k}$, find

(i) $\boldsymbol{a} \bullet \boldsymbol{b}$ and $\boldsymbol{a} \times \boldsymbol{b}$.

(ii) $|\boldsymbol{a} - \boldsymbol{b}|$.

(9 marks)

(b) Find the equation of a line that passes through (7, 9, 5) and parallel to the vector $\boldsymbol{v} = \langle -1, -3, 2 \rangle$.

(5 marks)

(c) Given P (7, –5, – 9), Q (–12, 4, 6) and R (–8, 4, 9). Find $\overline{PQ}$ and $\overline{PR}$. Hence find the equation of a plane.

(6 marks)

Q4 (a) Simplify in terms of i:

(i) $\sqrt{-49}$

(ii) $1 - 2\sqrt{-9}$

(4 marks)

(b) Express in the form of $a + bi$:

(i) $\frac{2+7i}{8-3i}$

(ii) $(3 + 5i)^2(\sqrt{4})i$

(6 marks)

(c) By using Euler form, find all the 3rd root of $z = 2 + 7i$ and plot the graph of three roots of z.

(10 marks)

Q5 A survey is done on the daily commuting time (in minutes) from home to work for all 25 employees of UTHM. The data is given as below:

Table **Q5**: Daily commuting time (minutes).

3	11	20	18	9
17	36	41	12	13
12	23	5	27	28
23	14	15	37	13
31	42	26	19	39

(a) Complete the table below using class limit (0 – 9), (10 – 19), and so on:

Class limit	Lower boundary	Class midpoint, x	f	fx	fx^2
			$\Sigma f =$	$\Sigma fx =$	$\Sigma fx^2 =$

(6 marks)

(b) Find

(i) Mean.

(ii) Median.

(iii) Mode.

(iv) Standard deviation

(14 marks)

Q6 (a) Adila intends to play a board game but she only have one dice. She then borrows one more dice from Adiha and play with her friends.

(i) Sketch the tree diagram and list down all the possible outcomes.

(ii) Find the probability of getting two similar values when both dices tossed.

(iii) Find the probability of getting the sum of 9 (of both dices' values) when both dices are tossed.

(10 marks)

(b) In New York, 51% of the adults are males and the 49% are females. A survey is done on the individual who smoke a cigar. The result show, 9.5% of males smoke cigars, whereas 1.7% of females smoke cigars (based on data from the Substance Abuse and Mental Health Services Administration). Given that New York's population is 100,000 people.

(i) Complete the contingency table below.

	Smoke Cigar (C)	Do Not Smoke Cigar (C')	Total
Male, M			
Female, F			
Total			

If one person was selected, find the probability that:

(ii) The person is female, given that she does not smoke cigars.

(iii) The person does not smoke cigar, with a condition that he is a male.

(10 marks)

Q7 (a) Given 8 % that of oranges out of 50 oranges in a box are rotten and there are 50 oranges in a box. If one orange is selected, what is the probability that

(i) exactly five oranges are rotten.

(ii) ten or more oranges are rotten.

(iii) between two and seven oranges are rotten.

(9 marks)

(b) During office hours, the number of the telephone ringing is two for every half hour. Find the

(i) probability that the telephone rings exactly seven for one hour.

(ii) mean number of telephone ringing in three hours.

(iii) probability the telephone rings at most once for three hours.

(7 marks)

(c) It has been found that the annual rainfall in a town follows a normal distribution with the mean 61 cm and standard deviation 15 cm. What are the probability that the annual rainfall will be below 53 cm?

(4 marks)

- END OF QUESTION -

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Formula

$$\boldsymbol{a}\bullet\boldsymbol{b}=a_1b_1+a_2b_2+a_3b_3,\ \boldsymbol{a}\times\boldsymbol{b}=\begin{vmatrix} i & j & \boldsymbol{k} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix},\ \cos\theta=\frac{\boldsymbol{a}\bullet\boldsymbol{b}}{|\boldsymbol{a}||\boldsymbol{b}|}$$

$$x=x_0+a_1t,\quad y=y_0+a_2t,\quad z=z_0+a_3t \text{ and } \frac{x-x_o}{a_1}=\frac{y-y_o}{a_2}=\frac{z-z_o}{a_3}$$

$$A(x-x_0)+B(y-y_0)+C(z-z_0)=0$$

$$re^{i\theta}=\cos\theta+i\sin\theta,\quad re^{in\theta}=r\,[\text{kos } n\theta+i\sin n\theta]$$

$$z=re^{i\theta+2k\pi} \text{ then } z^{\frac{1}{n}}=r^{\frac{1}{n}}e^{\left(\frac{\theta+2k\pi}{n}\right)i}.$$

If $z=r\,[\cos\theta+i\sin\theta]$ then $z^n=r^n\,[\cos n\theta+i\sin n\theta]$

If $z=\ z=r(\cos\theta+i\sin\theta)$ then $z^{\frac{1}{n}}=$ If $z=\ r^{\frac{1}{n}}\left(\cos\frac{\theta+2k\pi}{n}+i\sin\frac{\theta+2k\pi}{n}\right)$

$$\bar{x}=\frac{\Sigma f_i x_i}{\Sigma f_i},\quad M=L_M+c\left[\frac{\frac{n}{2}-F}{f_m}\right],\quad M_o=L_{M_o}+c\left[\frac{\Delta_a}{\Delta_a+\Delta_b}\right],$$

$$s^2=\frac{1}{\Sigma f-1}\left[\sum_{i=1}^{n} f_i x_i^2-\frac{(\Sigma f_i x_i)^2}{\Sigma f}\right]$$

$$\sum_{i=-\infty}^{\infty}p(x_i)=1,\ E(X)=\sum_{\forall x}xp(x),\ \int_{-\infty}^{\infty}f(x)\ dx=1,\ E(X)=\int_{-\infty}^{\infty}xp(x)\ dx,$$

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

$$P(x)=\binom{n}{x}\cdot p^x\cdot(1-p)^{n-x}\quad x=0,1,\ldots,n,\ P(X=r)=\frac{e^{-\mu}\cdot\mu^r}{r!}\quad r=0,1,\ldots,\infty,$$

$$X\sim N(\mu,\sigma^2),\quad Z\sim N(0,1) \text{ and } Z=\frac{X-\mu}{\sigma},\ \bar{X}\sim N\left(\mu,\frac{\sigma^2}{n}\right)$$

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Table 1

CUMULATIVE BINOMIAL PROBABILITIES

p = probability of success in a single trial; n = number of trials. The table gives the probability of obtaining r or more successes in n independent trials. i.e.

$$\sum_{x=r}^{n} \binom{n}{x} p^{x}(1-p)^{n-x}$$

When there is no entry for a particular pair of values of r and p, this indicates that the appropriate probability is less than 0.000 05. Similarly, except for the case r = 0, when the entry is exact, a tabulated value of 1.0000 represents a probability greater than 0.999 95.

	p=	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
n=2	r=0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.0199	.0396	.0591	.0784	.0975	.1164	.1351	.1536	.1719
	2	.0001	.0004	.0009	.0016	.0025	.0036	.0049	.0064	.0081
n=5	r=0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.0490	.0961	.1413	.1846	.2262	.2661	.3043	.3409	.3760
	2	.0010	.0038	.0085	.0148	.0226	.0319	.0425	.0544	.0674
	3		.0001	.0003	.0006	.0012	.0020	.0031	.0045	.0063
	4						.0001	.0001	.0002	.0003
n=10	r=0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.0956	.1829	.2626	.3352	.4013	.4614	.5160	.5656	.6106
	2	.0043	.0162	.0345	.0582	.0861	.1176	.1517	.1879	.2254
	3	.0001	.0009	.0028	.0062	.0115	.0188	.0283	.0401	.0540
	4			.0001	.0004	.0010	.0020	.0036	.0058	.0088
	5					.0001	.0002	.0003	.0006	.0010
	6									.0001
n=20	r=0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.1821	.3324	.4562	.5580	.6415	.7099	.7658	.8113	.8484
	2	.0169	.0599	.1198	.1897	.2642	.3395	.4131	.4831	.5484
	3	.0010	.0071	.0210	.0439	.0755	.1150	.1610	.2121	.2666
	4		.0006	.0027	.0074	.0159	.0290	.0471	.0706	.0993
	5			.0003	.0010	.0026	.0056	.0107	.0183	.0290
	6				.0001	.0003	.0009	.0019	.0038	.0068
	7						.0001	.0003	.0006	.0013
	8								.0001	.0002
n=50	r=0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.3950	.6358	.7819	.8701	.9231	.9547	.9734	.9845	.9910
	2	.0894	.2642	.4447	.5995	.7206	.8100	.8735	.9173	.9468
	3	.0138	.0784	.1892	.3233	.4595	.5838	.6892	.7740	.8395
	4	.0016	.0178	.0628	.1391	.2396	.3527	.4673	.5747	.6697
	5	.0001	.0032	.0168	.0490	.1036	.1794	.2710	.3710	.4723
	6		.0005	.0037	.0144	.0378	.0776	.1350	.2081	.2928
	7		.0001	.0007	.0036	.0118	.0289	.0583	.1019	.1596
	8			.0001	.0008	.0032	.0094	.0220	.0438	.0768
	9				.0001	.0008	.0027	.0073	.0167	.0328
	10					.0002	.0007	.0022	.0056	.0125
	11						.0002	.0006	.0017	.0043
	12							.0001	.0005	.0013
	13								.0001	.0004
	14									.0001

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Table 2

CUMULATIVE POISSON PROBABILITIES

The table gives the probability that r or more random events are contained in an interval when the average number of such events per interval is m, i.e.

$$\sum_{x=r}^{\infty} e^{-m} \frac{m^x}{x!}$$

Where there is no entry for a particular pair of values of r and m, this indicates that the appropriate probability is less than 0.000 05. Similarly, except for the case r = 0 when the entry is exact, a tabulated value of 1.0000 represents a probability greater than 0.999 95.

m =	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	.0952	.1813	.2592	.3297	.3935	.4512	.5034	.5507	.5934	.6321
2	.0047	.0175	.0369	.0616	.0902	.1219	.1558	.1912	.2275	.2642
3	.0002	.0011	.0036	.0079	.0144	.0231	.0341	.0474	.0629	.0803
4		.0001	.0003	.0008	.0018	.0034	.0058	.0091	.0135	.0190
5				.0001	.0002	.0004	.0008	.0014	.0023	.0037
6							.0001	.0002	.0003	.0006
7										.0001

m =	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	.6671	.6988	.7275	.7534	.7769	.7981	.8173	.8347	.8504	.8647
2	.3010	.3374	.3732	.4082	.4422	.4751	.5068	.5372	.5663	.5940
3	.0996	.1205	.1429	.1665	.1912	.2166	.2428	.2694	.2963	.3233
4	.0257	.0338	.0431	.0537	.0656	.0788	.0932	.1087	.1253	.1429
5	.0054	.0077	.0107	.0143	.0186	.0237	.0296	.0364	.0441	.0527
6	.0010	.0015	.0022	.0032	.0045	.0060	.0080	.0104	.0132	.0166
7	.0001	.0003	.0004	.0006	.0009	.0013	.0019	.0026	.0034	.0045
8			.0001	.0001	.0002	.0003	.0004	.0006	.0008	.0011
9							.0001	.0001	.0002	.0002

m =	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1	.8775	.8892	.8997	.9093	.9179	.9257	.9328	.9392	.9450	.9502
2	.6204	.6454	.6691	.6916	.7127	.7326	.7513	.7689	.7854	.8009
3	.3504	.3773	.4040	.4303	.4562	.4816	.5064	.5305	.5540	.5768
4	.1614	.1806	.2007	.2213	.2424	.2640	.2859	.3081	.3304	.3528
5	.0621	.0725	.0838	.0959	.1088	.1226	.1371	.1523	.1682	.1847
6	.0204	.0249	.0300	.0357	.0420	.0490	.0567	.0651	.0742	.0839
7	.0059	.0075	.0094	.0116	.0142	.0172	.0206	.0244	.0287	.0335
8	.0015	.0020	.0026	.0033	.0042	.0053	.0066	.0081	.0099	.0119
9	.0003	.0005	.0006	.0009	.0011	.0015	.0019	.0024	.0031	.0038
10	.0001	.0001	.0001	.0002	.0003	.0004	.0005	.0007	.0009	.0011
11					.0001	.0001	.0001	.0002	.0002	.0003
12									.0001	.0001

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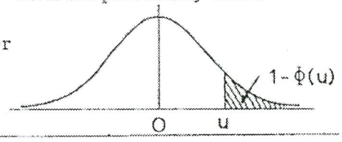
Table 3

AREAS IN TAIL OF THE NORMAL DISTRIBUTION

The function tabulated is $1 - \Phi(u)$ where $\Phi(u)$ is the cumulative distribution function of a standardised Normal variable u. Thus $1 - \Phi(u) = \frac{1}{\sqrt{2\pi}} \int_u^{\infty} e^{-u^2/2}\,du$ is the probability that a standardised Normal variable selected at random will be greater than a value of u $\left(= \frac{x-\mu}{\sigma}\right)$



$\frac{(x-\mu)}{\sigma}$	.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									
3.1	.00097									
3.2	.00069									
3.3	.00048									
3.4	.00034									
3.5	.00023									
3.6	.00016									
3.7	.00011									
3.8	.00007									
3.9	.00005									
4.0	.00003									