Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2014/2015

COURSE NAME	:	TECHNICAL MATHEMATICS III
COURSE CODE	:	DAS 21203
PROGRAMME	:	2 DAB, 2 DAJ, 2 DAR, 2 DAK
EXAMINATION DATE	:	DECEMBER 2014 / JANUARY 2015
DURATION	:	3 HOURS
INSTRUCTION	:	A) ANSWER **ALL** QUESTIONS B) ANSWER **THREE (3)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

SECTION A

Q1 (a) A car service centre has twelve (12) 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
$P(X=x)$			

(6 marks)

(ii) Based on **Q1** (a)(i), find $P(-1 \leq X < 1)$ and Sd(X).

(6 marks)

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

$$f(x) = \begin{cases} 0, & x < 0 \\ k(3x^2 - 2x), & 0 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

Find

(i) Value of k

(3 marks)

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

(3 marks)

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

(2 marks)

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

(i) exactly twelve heads.

(3 marks)

(ii) between 17 and 20 heads, inclusively.

(4 marks)

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

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

(2 marks)

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

(2 marks)

(iii) probability below than two students late per week.

(3 marks)

(c) According to recent surveys, 1% of students used the desktop in the library and the rest bring their personal laptop to find information or doing assignments. A librarian randomly selects 400 students who enter the library to ask a few questions. By using Poisson approximation, find

(i) mean and standard deviation of students using desktop in library.

(3 marks)

(ii) probability that less than 10 students used the desktop in the library.

(3 marks)

SECTION B

Q3 (a) Given $\boldsymbol{u} = 3\boldsymbol{i} - \boldsymbol{k}$, $\boldsymbol{v} = 2\boldsymbol{i} - 3\boldsymbol{j} + 7\boldsymbol{k}$ and $\boldsymbol{w} = -5\boldsymbol{i} - 2\boldsymbol{j} + \boldsymbol{k}$.

(i) $|3\boldsymbol{u} - \boldsymbol{v} + 2\boldsymbol{w}|$

(4 marks)

(ii) $\boldsymbol{u} \bullet (2\boldsymbol{v} \times \boldsymbol{w})$

(5 marks)

(b) Find the symmetric vector equation of the line that passes through point A(0,4,5) and parallel to vector $\boldsymbol{v} = 3\boldsymbol{i} - 2\boldsymbol{k}$

(3 marks)

(c) Find the equation of the plane passing through point $P(-4,1,1)$, $Q(-2,0,1)$ and $R(1,-2,-3)$. Hence find the distance between the plane and point $(3,0,1)$.

(8 marks)

Q4 (a) If $z_1 = 3 + 4i$ and $z_2 = 6 - 5i$. Determine

(i) $z_1 - 4z_2$

(2 marks)

(ii) $z_1 z_2$

(3 marks)

(b) Given $z = \dfrac{1-2i}{3-i}$.

(i) State the conjugate to be used for solving the above equation.

(1 marks)

(ii) Express z in $(a + bi)$ and polar form.

(6 marks)

(c) By using Euler form, find all the third root for $z = 3 + 4i$.

(8 marks)

Q5 (a) A number of cars entering the area of university within ten hours was recorded by the security as below;

33 14 22 18 22 14 16 21 23 10

Determine mean, median and standard deviation.

(7 marks)

(b) Table **Q5(b)** shows the lifetime of 40 batteries that were recorded from production batches of ABC Battery Manufacturing.

Table **Q5(b)**

Class	Frequency
1.5 – 1.9	2
2.0 – 2.4	1
2.5 – 2.9	4
3.0 – 3.4	15
3.5 – 3.9	10
4.0 – 4.4	5
4.5 – 5.0	3

(i) Build a table to show its class boundary, class midpoint, cumulative frequency for the above data.

(5 marks)

(ii) Find the mean, mode and median for the above data.

(8 marks)

Q6 (a) An experiment involves tossing a four-sided dice. Let X be a random variable giving the number of number ''4'' appears when a dice is tossed twice.

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

(4 marks)

(ii) Find the probability of getting different values appear in both tossed.

(2 marks)

(iii) Find the probability of getting prime number in first tossed and even number in second tossed.

(2 marks)

(iv) Find the probability of getting odd number when the value were substracted.

(2 marks)

(b) The table **Q6 (b)** below represents the UTHM's degrees awarded in 2014 by gender.

Table Q6 (b)

	Men	Women
Doctorate	14	15
Master's	225	263
Bachelor's	707	1670
Diploma's	323	300

If a degree was selected at random, find the probability that

(i) degree awarded to a women given that she got a doctarate.

(4 marks)

(ii) a master's degree or a diploma's degree

(3 marks)

(iii) a bachelor's degree awarded to a men

(3 marks)

Q7 (a) 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 is the probability that the annual rainfall will be below 53 cm?

(4 marks)

(b) Among all 18 to 20 years old teenager, 56% are enrolled in university. A random sample of 500 teenagers are randomly selected.

(i) Show that the normal distribution can be used to approximate binomial probabilities.

(3 marks)

(ii) Find the mean and standard deviation.

(2 marks)

(iii) By using the continuity correction factor, find the probability that at least 250 teenagers will be enrolled in university.

(4 marks)

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

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

(2 marks)

(ii) mean number of telephone ringing for every three hours.

(2 marks)

(iii) probability the highest telephone rings is twice for every three hours.

(3 marks)

- END OF QUESTION –

FINAL EXAMINATION

SEMESTER/SESSION: SEM I / 20142015 PROGRAMME : 2 DAB, 2 DAJ, 2 DAR, 2 DAK

COURSE : TECHNICAL MATHEMATICS III COURSE CODE : DAS 21203

Table 1: Vector

$\lvert\boldsymbol{u}\rvert = \sqrt{a^2 + b^2 + c^2}$	$\hat{\boldsymbol{u}} = \frac{\boldsymbol{u}}{\lvert\boldsymbol{u}\rvert}$
$\boldsymbol{u} \bullet \boldsymbol{v} = u_1v_1 + u_2v_2 + u_3v_3$	$\boldsymbol{u} \bullet \boldsymbol{v} = \lvert\boldsymbol{u}\rvert\lvert\boldsymbol{v}\rvert \cos\theta$
$\theta = \cos^{-1}\left(\frac{\boldsymbol{u} \bullet \boldsymbol{v}}{\lvert\boldsymbol{u}\rvert\lvert\boldsymbol{v}\rvert}\right)$	$A = \frac{1}{2}\lvert\boldsymbol{u} \times \boldsymbol{v}\rvert$
$\boldsymbol{u} \times \boldsymbol{v} = (u_2v_3 - u_3v_2)\boldsymbol{i} - (u_1v_3 - u_3v_1)\boldsymbol{j} + (u_1v_2 - u_2v_1)\boldsymbol{k}$	
If plane equation is $ax + by + cz + d = 0$ Then distance, $D = \left\lvert\frac{ax_0 + by_0 + cz_0 + d}{\sqrt{a^2 + b^2 + c^2}}\right\rvert$	

Table 2: Complex Number

$z = a + bi$ $\bar{z} = a - bi$	$z = r(\cos\theta + i\sin\theta)$
$r = \sqrt{a^2 + b^2}$	$\theta = \tan^{-1}\left(\frac{b}{a}\right)$
$z_1z_2 = r_1r_2[\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)]$	
$\frac{z_1}{z_2} = \frac{r_1}{r_2}[\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)]$	
$z = re^{i\theta}$	$z^n = r^n e^{in\theta}$
$z^{\frac{1}{n}} = r^{\frac{1}{n}} e^{\left(\frac{\theta + 2k\pi}{n}\right)i}$	$z^n = r^n[\cos n\theta + i\sin n\theta]$
$z^{\frac{1}{n}} = r^{\frac{1}{n}}\left(\cos\frac{\theta + 2k\pi}{n} + i\sin\frac{\theta + 2k\pi}{n}\right)$	

FINAL EXAMINATION

SEMESTER/SESSION: SEM I / 20142015 PROGRAMME : 2 DAB, 2 DAJ, 2 DAR, 2 DAK
COURSE : TECHNICAL MATHEMATICS III COURSE CODE : DAS 21203

Table 3: Probability

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	$P(A\|B) = \dfrac{P(A \cap B)}{P(B)}$

Table 4: Descriptive Statistics

$\mu = \dfrac{\sum_{i=1}^{n} x_i}{N}$	$\bar{x} = \dfrac{\sum_{i=1}^{n} x_i}{n}$
$\sigma^2 = \dfrac{\sum_{i=1}^{n}(x_i - \mu)^2}{N}$	$s^2 = \dfrac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n-1}$
$s^2 = \dfrac{1}{\sum f - 1}\sum_{i=1}^{n} f_i(x_i - \bar{x})^2$ or	$s^2 = \dfrac{1}{\sum f - 1}[\sum_{i=1}^{n} f_i {x_i}^2 - \dfrac{(\sum f_i x_i)^2}{\sum f}]$
$M = L_m + C(\dfrac{\frac{n}{2} - F}{f_m})$	$M_0 = L + C(\dfrac{d_1}{d_1 + d_2})$

Table 5: Probability Distribution

Binomial $X \sim B(n,p) = \binom{n}{r} p^r (1-p)^{n-r}$ for $n = 0,1,\ldots,n$
Poisson $X \sim P_O(\mu) = \dfrac{e^{-\mu}\mu^r}{r!}$ for $\mu = 0,1,2 \ldots$
Normal $X \sim N(\mu, \sigma^2)$, $f(x) = \dfrac{1}{\sqrt{2\pi\sigma^2}} e^{-\left[\frac{(x-\mu)^2}{2\sigma^2}\right]}$
Standard Normal $Z \sim N(0,1)$, $f(z) = \dfrac{1}{\sqrt{2\pi}} e^{-\left[\frac{z^2}{2}\right]}$, $z = \dfrac{x-\mu}{\sigma}$