

**CONFIDENTIAL**



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER I  
SESSION 2017/2018**

COURSE NAME : TECHNICAL MATHEMATICS III  
COURSE CODE : DAS 21203  
PROGRAMME : DAK  
EXAMINATION DATE : DECEMBER 2017 / JANUARY 2018  
DURATION : 3 HOURS  
INSTRUCTIONS : SECTION A) ANSWER ALL  
QUESTIONS  
SECTION B) ANSWER **THREE (3)**  
QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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**SECTION A**

**Q1** (a) The discrete random variable  $X$  has the probability distribution function

$$P(X = x) = \begin{cases} kx, & x = 2,4,6 \\ k(x - 2), & x = 8 \\ 0, & \text{else} \end{cases}$$

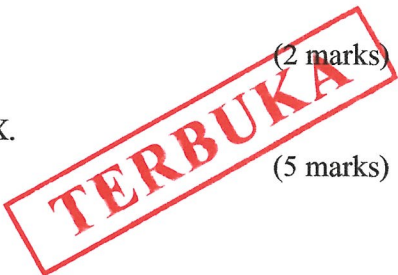
- (i) Find the value of constant  $k$ . (2 marks)
- (ii) Obtain the table of probability distribution of  $X$ . (1 marks)
- (iii) Find  $P(3.3 < X < 9.9)$  (2 marks)
- (iv) Find the expected value,  $E(X)$ . (2 marks)
- (v) Find  $Var(X)$ . (3 marks)

(b)  $X$  is a continuous random variable with probability density function given by

$$f(x) = \begin{cases} c(9 - x^2), & 0 \leq x \leq 3 \\ 0, & \text{else} \end{cases}$$

where  $c$  is constant.

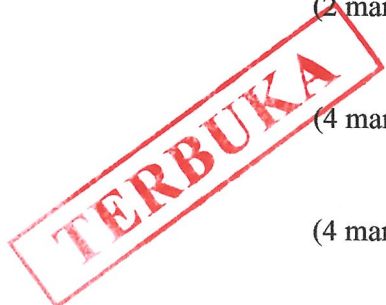
- (i) Find the value of  $c$ . (2 marks)
- (ii) Find the cumulative distribution function of  $X$ . (5 marks)
- (iii) Show that the expected value,  $E(X) = \frac{9}{8}$  (3 marks)



- Q2** (a) A clothing store has determined that 15% of the people who enter the store will make a purchase. Ten people enter the store during a one-hour period. Find the probability that at least one person will make a purchase. (3 marks)
- (b) The mean number of students late to class per day is three. Find the
- (i) probability exactly three students late to class per day. (2 marks)
- (ii) mean number of students late to class per week. (2 marks)
- (iii) probability at most two students late per week. (3 marks)
- (c) Statistics released by the National Highway Traffic Safety Administration show that on average 100 of all automobiles undergoing a headlight inspection with a variance of 64 failed the inspection. What is the probability that
- (i) at most 85 of the automobiles failed the inspection. (5 marks)
- (ii) between 110 and 120 of the automobiles failed the inspection. (5 marks)

**SECTION B**

- Q3** (a) Let  $a = i - 2j + 2k$ ,  $b = 3j + 2k$  and  $c = -4i + j - 3k$ . Find
- (i)  $a \cdot b$  (2 marks)
- (ii)  $b \times c$  (4 marks)
- (iii)  $(c \times a) \cdot b$  (4 marks)
- (b) Find an equation of the line that passes through  $M(2,3,5)$  and  $N(1, -1, -2)$ . (4 marks)



- (c) Find the vector equation of the plane containing  $P(-1, 2, 1)$ ,  $Q(0, -3, 2)$  and  $R(1, 1, -4)$ .

(6 marks)

- Q4** (a) If  $v = 2 - 3i$  and  $w = 3 + i$ , express  $z = \frac{2v+w}{w}$  in the form of  $a + bi$ .

(5 marks)

- (b) Given  $z_1 = 1 + i\sqrt{3}$  and  $z_2 = 6 + 8i$ .

- (i) Express  $\frac{z_1}{z_2}$  in polar form.

(6 marks)

- (ii) Express  $z_1z_2$  in polar form.

(4 marks)

- (c) Applying De Moivre's Theorem, calculate  $(1 + i\sqrt{3})^5$  in the form of  $a + bi$ .

(5 marks)

- Q5** (a) The data shown are the number of grams per serving of 35 selected brands of nuts. Copy and complete the **Table Q5**.

**Table Q5**

Class limit	Lower boundary	$x$	$f$	$f_ix_i$	$x_i^2$	$f_ix_i^2$
1-19			13			
20-38			8			
39-57			6			
58-76			5			
77-95			3			
			$\Sigma =$	$\Sigma =$		$\Sigma =$

(6 marks)

- (b) Find

- (i) mean.

(2 marks)

- (ii) mode

(3 marks)

- (iii) median

(5 marks)

(iv) standard deviation

(4 marks)

**Q6** (a) In my town, it's rainy one third of the days. Given that it is rainy, there will be heavy traffic with probability  $\frac{1}{2}$ , and given that it is not rainy, there will be heavy traffic with probability  $\frac{1}{4}$ . If it's rainy and there is heavy traffic, I arrive late for work with probability  $\frac{1}{2}$ . On the other hand, the probability of being late is reduced to  $\frac{1}{8}$  if it is not rainy and there is no heavy traffic. In other situations ( rainy and no traffic, not rainy and traffic ) the probability of being late is 0.25. You pick a random day.

(i) Draw a tree diagram

(5 marks)

(ii) What is the probability that it's not raining and there is heavy traffic and I am not late?

(3 marks)

(iii) What is the probability that I am late?

(3 marks)

(iv) Given that I arrived late at work, what is the probability that it rained that day?

(5 marks)

(b) In an exam, two reasoning problems, 1 and 2 are asked. 35% students solved problem 1 and 15% students solved both the problems. What is the probability students who solved the first problem will also solve the second one?

(4 marks)

- END OF QUESTIONS -

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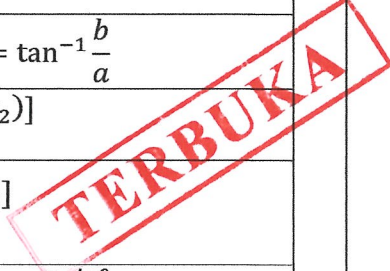
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Table 1: Vector

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

Table 2: Complex Number

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





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Table 3: Probability

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	$P(A B) = \frac{P(A \cap B)}{P(B)}$
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Table 4: Descriptive Statistics

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

Table 5: Probability Distribution

Binomial $X \sim B(n, p) = \binom{n}{r} p^r (1 - p)^{n-r}$ for $n = 0, 1, \dots, n$
Poisson $X \sim P_0(\mu) = \frac{e^{-\mu} \mu^r}{r!}$ for $\mu = 0, 1, 2, \dots$
Normal $X \sim N(\mu, \sigma^2)$ , $f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{-\left[\frac{(x-\mu)^2}{2\sigma^2}\right]}$
Standard Normal $Z \sim N(0,1)$ , $f(z) = \frac{1}{\sqrt{2\pi}} e^{-\left[\frac{z^2}{2}\right]}$ , $z = \frac{x - \mu}{\sigma}$

**TERBUKA**