SECTION A

STRUCTURED (50 marks)

INSTRUCTION:

This section consists of **THREE (3)** structured questions. Answer **TWO (2)** questions only.

QUESTION 1

(a) State the following terms into the simplest form [CLO 1 : C1]

i. $\frac{1}{3q}+\frac{q-6}{6q^2}$ (3 marks)

ii. $(p^2+q^2)-(p-q)^2$ (2 marks)

iii $\frac{24a^2m^3}{5m}\div\frac{8am}{25}$ (2 marks)

iv $\left(\frac{5}{v+5}-\frac{4}{v+4}\right)\times\left(\frac{v+4}{v}\right)$ (5 marks)

(b)

i. Express z in terms of x and y. [CLO 2 : C2]

(4 marks)

$x=\sqrt{\frac{zy}{z+2}}$

POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION

(MINISTRY OF HIGHER EDUCATION)

MATHEMATICS, SCIENCE & COMPUTER DEPARTMENT

FINAL EXAMINATION

JUNE 2012 SESSION

BA103: MATHEMATICS

DATE: 22 NOVEMBER 2012 (THURSDAY)

DURATION: 2 HOURS (11.15AM – 1.15 PM)

This paper consists of **TWELVE (12)** pages including the front page.
Section A: Structured (3 questions – answer TWO (2) questions)
Section B: Structured (3 questions – answer TWO (2) questions)

CONFIDENTIAL
DO NOT OPEN THIS QUESTION PAPER UNTIL INSTRUCTED BY THE CHIEF INVIGILATOR

(The CLO stated is for reference only.)

QUESTION 2

(a) Find the value for each of the following equations. [CLO1:C2]

i. $x^2 + 2x - 15 = 0$ (3 marks)

ii. $-x^2 + 2x + 3 = 0$ (3 marks)

iii. $2x^2 + x - 21 = 0$ (3 marks)

(b) Solve the following equations using **quadratic formula**: [CLO1:C3]

i. $4x^2 + 1 = 5x$ (5 marks)

ii. $x^2 + 4x = \frac{2x+1}{2}$ (5 marks)

iii. $\frac{4p-3}{4} = \frac{5p+2}{3p}$ (6 marks)

ii. Given $v = \frac{1}{3}r^2h + 4w$, find w if h = 2, r = 3 and v = 4 [CLO 2 : C2] (4 marks)

iii. Given $S = \sqrt{Q^2 + (4\pi VL)^2} - 3S$ express V as a subject. [CLO 2 : C2] (5 marks)

SECTION B

STRUCTURED (50 marks)

INSTRUCTION:

This section consists of **THREE (3)** structured questions. Answer **TWO (2)** questions only.

QUESTION 4

(a) Find the value of : [CLO1:C1]

i. Sin 231^0 (1 mark)

ii. Cos 313^0 (1 mark)

iii. Tan 116^0 (1 mark)

(b) Find the value of x for the following equation for $0^0 \leq x \leq 360^o$ [CLO 2 : C1]

i. Sin x = - 0.2924 (3 marks)

ii. Cos x = sin 45^0 (3 marks)

QUESTION 3

(a) Simplify each of the followings expressions below in single logarithm term:

[CLO1:C1]

i. $\frac{1}{3}\log_3 x - 2\log_3 y$ (2 marks)

ii. $\log_2 x^2 + 3\log_2 y - 1$ (3 marks)

(b) Given $log_3\ 2 = 0.36$ and $log_3\ 4 = 1.36$, without using calculator, find the values: [CLO1:C1]

i. $\log_3 8$ (3 marks)

ii. $\log_3 0.5$ (3 marks)

iii. $\log_4 \frac{1}{64}$ (4 marks)

(c) Calculate the value of x for the following equations. [CLO2:C3]

i. $\log_x 8 + \log_x 4 = 5$ (4 marks)

ii. $\log_3 3x + \log_9 x = \frac{5}{2}$ (6 marks)

QUESTION 5

(a) Find the value of x for the figures below. [CLO 1:C3]
(2 marks)

i.

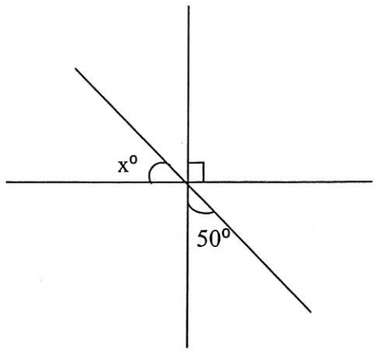
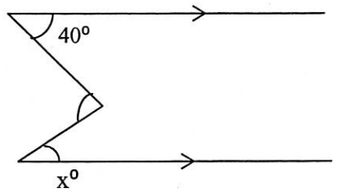


Figure 5(a)(i)

ii

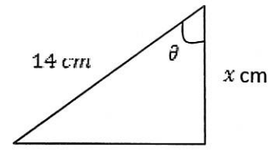


(2 marks)

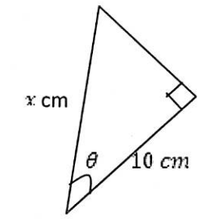
Figure 5(a)(ii)

(c) For the following right-angle triangle, calculate the value of x using the given value of Cos θ [CLO 3 : C3] (16marks)

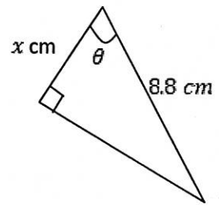
i. $\cos\theta = \frac{3}{7}$



iii. $\cos\theta = \frac{4}{5}$

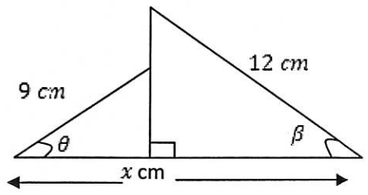


ii. $\cos\theta = 0.59$



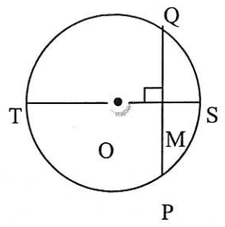
iv. $\cos\theta = 0.8$

$\cos\beta = \frac{2}{3}$



(c)

i) The figure 5(c)(i) shows a circle with centre O. TOS and PMQ are straight lines. M is the midpoint of OS and QP. QP = 12 cm and TS= 20 cm. Find the length of QT in cm.



[CLO3:C3]

Figure 5(c)(i) (4 marks)

ii) In figure 5(c)(ii), STU and SPQ are straight lines. If ST =3 cm and PQ=1cm, find : [CLO3:C3]

a) the length of TU (5 marks)

b) the length of PT (3 marks)

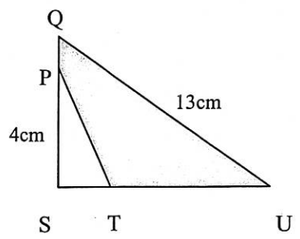
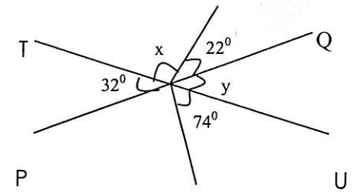


Figure 5(c)(ii)

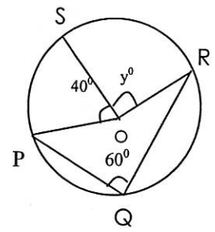
iii In figure 5(a)(iii), PQ and TU are straight lines. Find the value of x-y.



[CLO 1:C3]

Figure 5(a)(iii) (5 marks)

(b) In figure 5(b), O is the centre of the circle PQRS. Find the value of y.



CLO 2:C3

Figure 5(b) (4 marks)

(b)

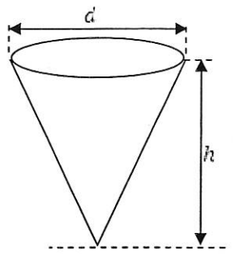


Figure (6)(b)

Diagram above shows a cone shape container with diameter, $d = 45mm$ and height, $h = 62mm$. The container is filled with $\frac{3}{4}$ volume of water. Calculate the volume of water. [CLO 2:C2]

(6 marks)

(c) Length of the arc of a sector is given by $3xcm$ and the angle of the sector, $\theta = 36^\circ$. Calculate [CLO3:CO2]

i. The diameter of the circle in term of x. (6 marks)

ii. The value of x if given the area of the sector, $A = 84cm^2$. (6 marks)

QUESTION 6

(a)

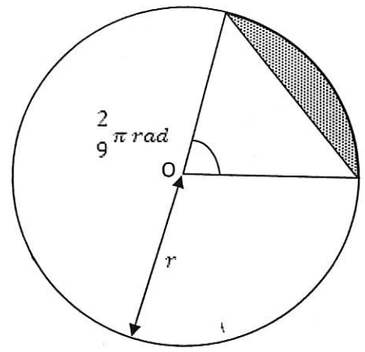


Figure (6)(a)

In Figure (6)(a), given that the angle of the minor sector is $\frac{2}{9}\pi\ rad$ and the arc length is $45cm$. Calculate the followings: [CLO1:C2]

i. Radius of the circle, r. (3 marks)

ii. Area of the shaded region. (4 marks)

FORMULA SHEET FOR MATHEMATICS (BA103)

INDICES AND LOGARITHM

Basic of Index and Logarithm

1. $y = a^x \leftrightarrow x = \log_a y$

Rules of Indices

1. $a^m \times a^n = a^{m+n}$
2. $\frac{a^m}{a^n} = a^{m-n}$
3. $(a^m)^n = a^{mn}$
4. $(ab)^n = a^n b^n$
5. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0$
6. $a^{-n} = \frac{1}{a^n}, a \neq 0$
7. $a^{\frac{m}{n}} = \sqrt[n]{a^m}$

Rules of Logarithm

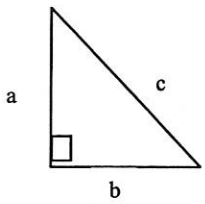
1. $\log_a MN = \log_a M + \log_a N$
2. $\log_a \frac{M}{N} = \log_a M - \log_a N$
3. $\log_a N^P = P \log_a N$

SOLVING QUADRATIC EQUATION

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

TRIGONOMETRY

Pythagoras' Theorem



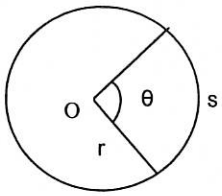
$$c^2 = a^2 + b^2$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

MEASUREMENT

Arc Length of a Circle

$$s = r\theta$$



Area of a Sector

$$A = \frac{1}{2} r^2 \theta$$

Area of a Segment

$$A = \frac{1}{2} r^2 \theta - \frac{1}{2} r^2 \sin\theta$$

FORMULA OF TRIANGLE

Area of Triangle $= \frac{1}{2} ab \sin C$

SURFACE AREA AND VOLUME

Cylinder : $A = 2\pi rh + 2\pi r^2$

$V = \pi r^2 h$

Cone : $A = \pi rs + \pi r^2$

$V = \frac{1}{3} \pi r^2 h$

Sphere : $A = 4\pi r^2$

$V = \frac{4}{3} \pi r^3$

Pyramid : A = area of four triangles + area of base

V = (1/3) x (area of base) x (height)