STRUCTURED (100 marks)

INSTRUCTION :

This section consists of **SIX (6)** structured questions. Answer **FOUR (4)** questions only.

QUESTION 1

a) Simplify the following algebraic fractions. [CLO 1]

   i. $\dfrac{-4p^6q^2}{pq^2}$ (2 marks)

   ii. $\dfrac{x}{3y} \times \dfrac{y}{2x}$ (2 marks)

   iii. $\dfrac{3n}{4m} \div \dfrac{n}{m}$ (2 marks)

   iv. $\dfrac{7-x}{5x} - \dfrac{5}{x}$ (3 marks)

b) Solve the algebraic fractions below. [CLO 2]

   i. $\dfrac{3}{y-2} - \dfrac{5}{2-y} = 2$ (4 marks)

   ii. $\dfrac{m+1}{m-2} = \dfrac{3}{5}$ (4 marks)

c) Simplify $\dfrac{8q-10}{q^2+2q-8} - \dfrac{7}{4+q}$ to the lowest form. [CLO 2]   (5 marks)

d) Given $\dfrac{ab}{2} = 2-a$, express a as the subject of the formula. [CLO 2]

   (3 marks)

POLITEKNIK
Jabatan Pengajian Politeknik

EXAMINATION AND EVALUATION DIVISION
DEPARTMENT OF POLYTECHNIC EDUCATION
(MINISTRY OF HIGHER EDUCATION)

MATHEMATICS, SCIENCE & COMPUTER DEPARTMENT

FINAL EXAMINATION

DECEMBER 2011 SESSION

BA103: MATHEMATICS

DATE : 26 APRIL 2012 (THURSDAY)
DURATION : 2 HOURS (11.15 AM – 1.15 PM)

This paper consists of **TEN (10)** pages including the
front page and appendix.
This paper consists of **SIX (6)** questions. Answer **FOUR (4)** questions only.

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

(CLO stated at the end of each question is referring to the learning outcome
of the topic assessed. The CLO stated is only for lectures' references.)

QUESTION 3

a) For each of the following, solve and state the answer in standard form correct to 3 significant figures. [CLO 1]

    i. $750\,890 + 10710$ (2 marks)

    ii. $0.008796320 - 0.002796$ (2 marks)

    iii. $(4.5 \times 10^{-3}) \div (2.3 \times 10^{4})$ (2 marks)

    iv. $(3.34 \times 10^{4}) + (5 \times 10^{3})$ (3 marks)

b) Simplify the following expression : [CLO 2]

$$5^{3n-1} \times 25^{2n+3} \div 125^{n-2}$$ (4 marks)

c) Find the value of x from the equation given : [CLO 2]

$$16^{x} = 1024^{3-x}$$ (5 marks)

d) Find the value of : [CLO 2]

    i. $\log_{4} 16$ (3 marks)

    ii. $\log_{8} 128$ (4 marks)

QUESTION 2

a) Solve the following quadratic equations : [CLO 1]

    i. $x^{2} - 16 = 0$ (3 marks)

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

    iii. $x^{2} + 6x + 8 = 0$ (3 marks)

    iv. $15x^{2} - 19x + 6 = 0$ (3 marks)

b) Solve $4 - 8x - 2x^{2} = 0$ using the **Quadratic Formula.**   (4 marks)
[CLO 1]

c) Solve the equation $\dfrac{2}{x+1} = \dfrac{x}{3-2x}$. [CLO 2]   (4 marks)

d) Solve $-3x^{2} - \dfrac{20}{3}x = -7$, using the **Factorization Method.** [CLO 2]

                                       (5 marks)

QUESTION 5

a)   In Figure 5(a), LMPQ is a straight line. Calculate the value of y. [CLO 1]

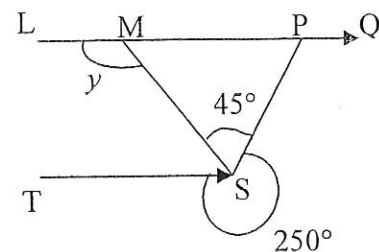Figure 5(a)   (4 marks)

b)   In Figure 5(b), EFG is a straight line. Find the value of y. [CLO 3]

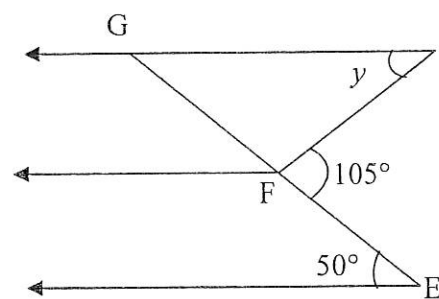Figure 5(b)   (4 marks)

c)   In Figure 5(c), ABC and ADE is a straight line. Find the value of: [CLO 3]
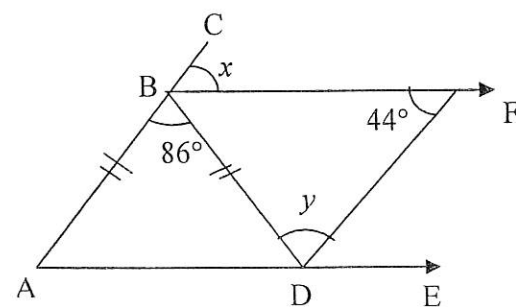
   i. x (4 marks)

   ii. y (1 mark)

Figure 5(c)

QUESTION 4

a)   For each of the following trigonometric functions, determine the reference angle. Then, find the value of the trigonometric function: [CLO 2]

   i.   cos 167°   (2 marks)

   ii.   tan (− 59°)   (2 marks)

   iii.   sin 326°   (2 marks)

b)

Figure 4(b)

   From Figure 4(b), find: [CLO 2]

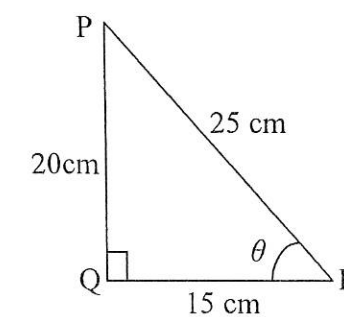   i.   cosec θ (2 marks)

   ii.   sec θ (2 marks)

   iii.   cot θ (2 marks)

c)   Solve each of the following trigonometric equations for $0° \leq \theta \leq 360°$. [CLO 2]

   i. $\sin \theta = 0.766$ (4 marks)

   ii. $\tan \theta = 0.702$ (4 marks)

d)   Given $\sin \dfrac{\theta}{2} = 0.208$, find $\cos \theta$ for $0° \leq \theta \leq 360°$. [CLO 3]   (5 marks)

QUESTION 6

a) Convert each of the following angles to degrees. (Use $\pi = 3.142$) [CLO 1]

   i. $2.34\,rad$ (2 marks)

   ii. $\dfrac{2\pi}{7}\,rad$ (2 marks)

b) In figure 6b(i) and 6b(ii), O is the center of the circles. Find : [CLO 3]

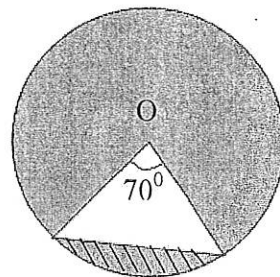   i. the area of the shaded segment if the radius of the circle is 5cm.

(4 marks)

Figure 6b(i)

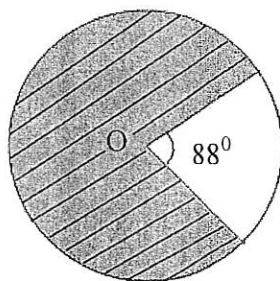   ii. the area of the shaded sector if the radius of the circle is 5cm.

(3 marks)

Figure 6b(ii)

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d) In Figure 5(d), RQS is a tangent to the circle with centre O at point Q. Find $\angle$ PQR. [CLO 3]
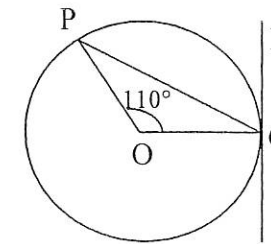
Figure 5(d) (4 marks)

e) In Figure 5(e), EFG and JHG are tangents to the circle at point F and H. The centre of the circle is O. Find the value of x. [CLO 3]
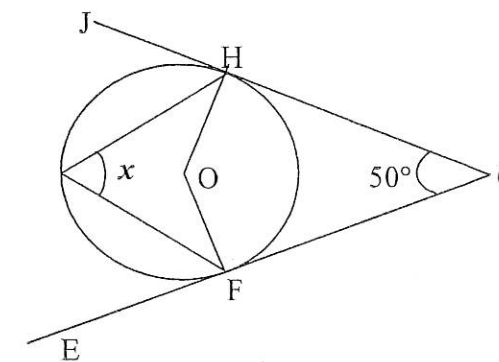

Figure 5(e) (4 marks)

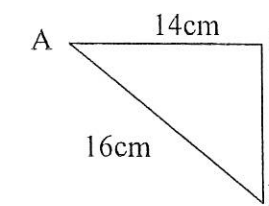f) In Figure 5(f), ABC is a right-angled triangle. Find the length of BC. [CLO 3]

Figure 5(f) (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. $a^m \times a^n = a^{m+n}$
5. $\left(\dfrac{a}{b}\right)^n = \dfrac{a^n}{b^n}$, $b \neq 0$

2. $\dfrac{a^m}{a^n} = a^{m-n}$
6. $a^{-n} = \dfrac{1}{a^n}$, $a \neq 0$

3. $\left(a^m\right)^n = a^{mn}$
7. $a^{\frac{m}{n}} = \sqrt[n]{a^m}$

4. $(ab)^n = a^n b^n$

Rules of Logarithm

1. $\log_a MN = \log_a M + \log_a N$

2. $\log_a \dfrac{M}{N} = \log_a M - \log_a N$

3. $\log_a N^P = P \log_a N$

SOLVING QUADRATIC EQUATION

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

TRIGONOMETRY

Pythagoras' Theorem

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

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

MEASUREMENT
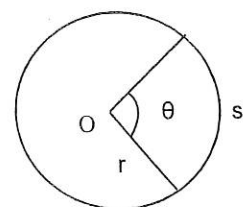
Arc Length of a Circle

$s = r\theta$

Area of a Sector

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

Area of a Segment

$A = \dfrac{1}{2} r^2 \theta - \dfrac{1}{2} r^2 \sin \theta$
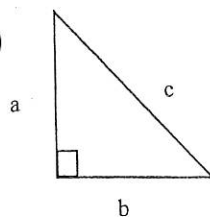
FORMULA OF TRIANGLE

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

SURFACE AREA AND VOLUME

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

Cone : $A = \pi rs + \pi r^2$
$V = \dfrac{1}{3} \pi r^2 h$

Sphere : $A = 4\pi r^2$
$V = \dfrac{4}{3} \pi r^3$

Pyramid : $A =$ area of four triangles + area of base
$V = (1/3)$ x (area of base) x (height)

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c)   In Figure 6(c), BDHG is a square. Find the perimeter of the whole figure. [CLO 2]

(6 marks)
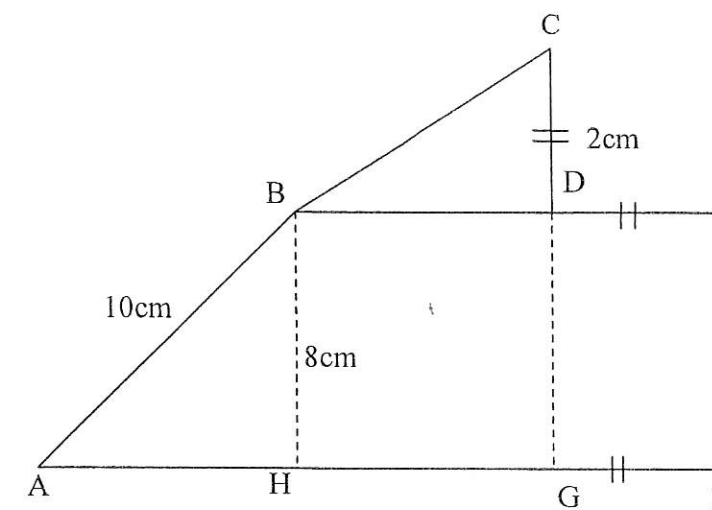

Figure 6(c)

d)   Figure 6 (d) shows the combination of a cylinder and a cone. [CLO 3]

i.   Find the radius of the cylinder if its volume is equal to 1206.37cm^3.

(4 marks)
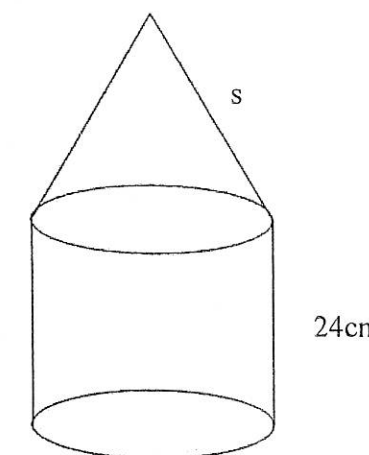
ii.   Find the volume of the cone if s = 6.5cm.

(4 marks)

Figure 6(d)