



COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 2

EEE327- MATHEMATICS FOR TRADE 2

FINAL EXAMINATION – PENSTER 4, 2012

DAY/DATE: _____ . TIME: _____ ROOM: as per timetable.

INSTRUCTIONS TO STUDENTS

1. *You are allowed 10 minutes Extra reading time during which you are NOT to write.*
2. *Begin each answer on a fresh page and use both sides of the sheet.*
3. *Write your candidate-number at the top of each attached sheet.*
4. *Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string.*
5. *For all sheets of paper on which rough/draft work has been done, cross it though and you MUST ATTACH to your answer scripts.*
6. *Write clearly the number(s) of the question(s) attempted on the top of each sheet.*
7. **ANSWER ALL QUESTIONS.**
8. *Show all workings where necessary.*
9. *Do not use programmable calculators, especially the ones that does the conversions of number systems.*
10. ***ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!***

SECTION A**MULTIPLE CHOICE****[20 MARKS]**

Circle the *letter* of the *best choice* in the **Answer Sheet** provided.

1. Transpose the formula: $v = u + \frac{ft}{m}$, to make f the subject
 - A. $f = \frac{m}{t} (u - v)$
 - B. $f = \frac{t}{m} (v - u)$
 - C. $f = \frac{1}{t} (mu - v)$
 - D. $f = \frac{t}{m} (v - u)$

2. Solve: $4(2r - 3) - 2(r - 4) = 3(r - 3) - 1$
 - A. 2
 - B. -3
 - C. -2
 - D. 3

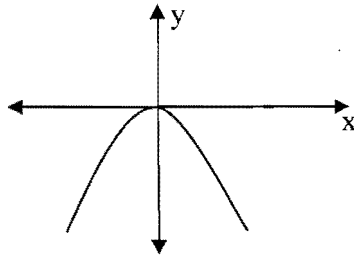
3. $x^2 - 36$ is equivalent to:
 - A. $(x - 6)(x + 6)$
 - B. $-6 - x^2$
 - C. $(x - 6)^2$
 - D. $(x - 6)(x - 6)$

4. When two resistors R_1 and R_2 are connected in parallel the formula $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}$ is used to determine the total resistance R_t . If $R_1 = 470 \Omega$ and $R_2 = 2.7 \text{ k}\Omega$, R_t (correct to 3 significant figures) is equal to:
 - A. 2.68 Ω
 - B. 400 Ω
 - C. 473 Ω
 - D. 3170 Ω

5. In hexadecimal, the decimal number 123 is:
 - A. 1111011
 - B. 123
 - C. 173
 - D. 7B

6. Identify the missing angle in a triangle; if the one angle read $45^\circ 29' 55''$, the other is $20^\circ 57' 15''$:
 - A. $66^\circ 27' 10''$
 - B. $113^\circ 32' 50''$
 - C. 113.5472222°
 - D. Both b) and c)

7. Which of the following is a Pythagorean Triad?
A. 6, 12, 13
B. 12, 14, 15
C. 8, 15, 16
D. 6, 8, 10
8. Which of the following is incorrect?
A. 1 revolution = 60 degree
B. 1 degree = 60 minute
C. 1 minute = 60 seconds
D. 1 degree = 3600 seconds
9. A rectangular plate is 85mm long and 42mm wide. Find its area in square centimeters.
A. 34.2 cm²
B. 35.7 cm²
C. 36.1 cm²
D. 37.4 cm²
10. In the general sinusoidal equation $y = A\sin(\omega t \pm \alpha)$; the leading phase shift is represented as:
A. $+\alpha$
B. $-\alpha$
C. $-$
D. $+$
11. What is the surface area formula of a cube if the volume of the cube is l^3 ?
A. l_3
B. l_2
C. l^2
D. l^5
12. Identify the given graph:



- A. $y = -x^2$
B. $y = x^2$
C. $y = x^2 + 1$
D. $y = -x^2 - 1$

13. $Z_1 = 3 + j5$ and $Z_2 = 3 + j4$; choose the appropriate answer for $Z_1 + Z_2$:
- A. $6 + j9$
 - B. $-11 + j7$
 - C. $29 + j27$
 - D. $3 + j5$
14. From the equation $3y = 9x - 7$, determine the gradient.
- A. 9
 - B. 7
 - C. 2
 - D. 3
15. State the general name for the angle 65° .
- A. Obtuse angle
 - B. Right angle
 - C. Acute angle
 - D. Reflex angle
16. What is the total surface area of the cube shown below if the length of one side of the cube is 3mm?
-
- A. 9mm^2
 - B. 54mm^2
 - C. 36mm^2
 - D. 3mm^2
17. Which of the following are supplementary angles?
- A. 0° and 90°
 - B. 160° and 200°
 - C. 89.1° and 90.9°
 - D. 36° and 54°
18. Identify the term that best describes one quarter of a whole circle:
- A. Chord
 - B. Quadrant
 - C. Sector
 - D. Segment
19. Name the quantity that has magnitude and direction:
- A. Gravity
 - B. Mass
 - C. Scalar
 - D. Vector
20. 1 radian is equivalent to:
- A. 2π
 - B. $360^\circ / 2\pi$
 - C. 180°
 - D. $180^\circ / 2\pi$

SECTION B

[20 MARKS]

Instruction:

Show all necessary working where applicable.

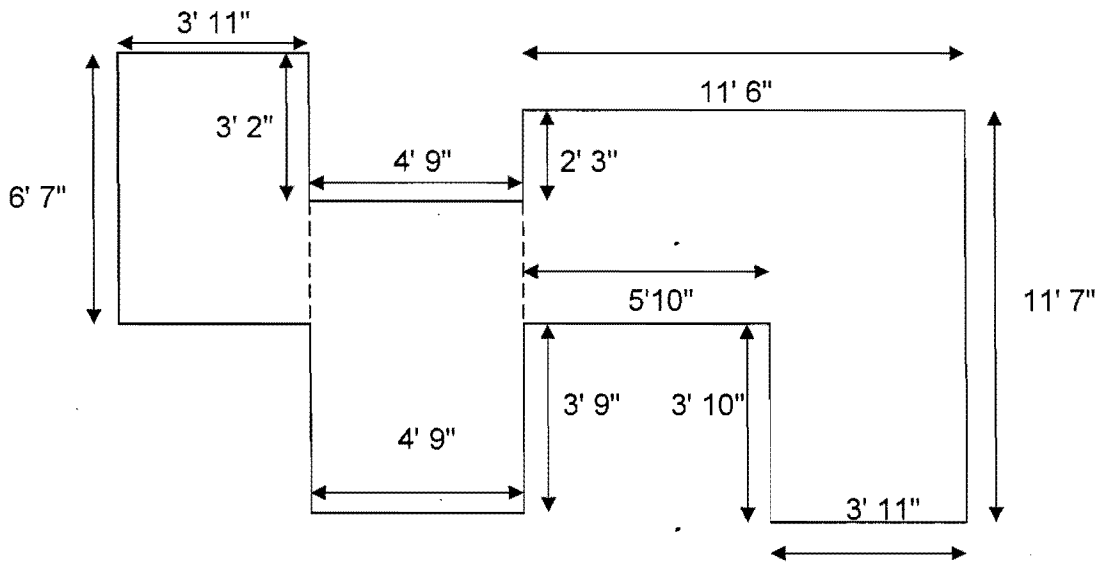
1. Transpose the formula

$$\frac{A\pi + x}{y} + \frac{AB + \pi}{j} = C$$

And make π the subject:

(6 marks)

2. What is the perimeter of the courtyard shown below? (answer to the nearest feet and inches)



(6 marks)

3. Force F newtons is given by $F = \frac{Gm_1m_2}{d^2}$, where m_1 and m_2 are masses, d their distance apart and G is a constant. Find the value of the force given that $G = 6.67 \times 10^{-11}$, $m_1 = 7.36$, $m_2 = 15.5$ and $d = 22.6$. Express the answer to 3 significant figures. (4 marks)

4. A ladder 60m long reaches to the top of a building when its foot stands 23m from the building. How high is the building? (4 marks)

(4 marks)

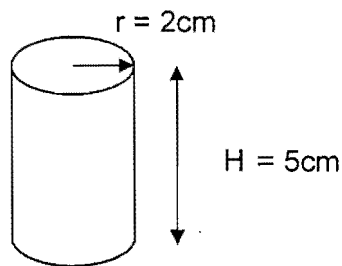
SECTION C

[20 MARKS]

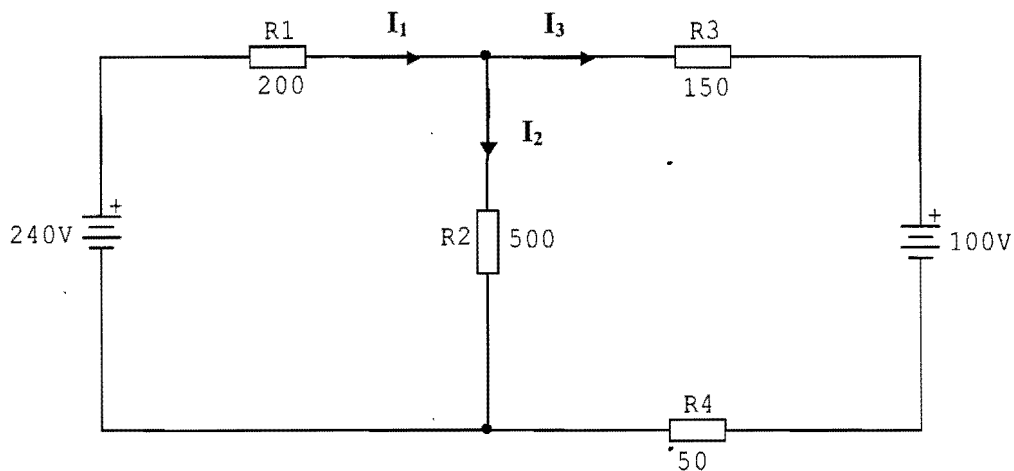
Instruction:

Show all necessary working where applicable.

1. What is the surface area of the cylinder shown in the figure (lateral surface + its one base area)? The radius of its base is 2 cm and its height is 5 cm. (5 marks)



2. Calculate the values of I_1 , I_2 and I_3 for the electrical circuit shown below:



(10 marks)

3. The law connecting friction F and load L for an experiment is of the form $F = aL + b$, where a and b are constants. When $F = 5.6$, $L = 8.0$ and when $F = 4.4$, $L = 2.0$. Find the values of a and b and the value of F when $L = 6.5$ (5 marks)

SECTION D:**[20 MARKS]****Instruction:***Show all necessary working where applicable.*

1. Sketch the graphs of:
 - a) $2y = -10x - 6$ (2 marks)
 - b) $y = -2x^2 - 1$ (2 marks)

2. Given $Z_1 = 3 + j4$ and $Z_2 = -2 + j3$. Calculate the resultant vector using graph method on a Cartesian plane for the followings:
 - a) $Z_1 + Z_2$ (2 marks)
 - b) $Z_2 - Z_1$ (2 marks)

3. A pendulum 2m in length swings so that the horizontal distance between the outermost positions of the end is 0.65m. Calculate the vertical height between the lowest and highest positions of the free end, correct to the nearest centimeter. (4 marks)

4. The resistance, R of a copper winding is measured at various temperatures, t ($^{\circ}\text{C}$) and the results are as shown below:

$R(\Omega)$	52	54.5	56.5	58.5	60.8	63
$t(^{\circ}\text{C})$	10	20	30	40	50	60

- a). Draw the graph of resistance, R of a copper winding, plotting R vertically on the **standard graph paper provided**. The graph has an equation in the form of $R = at + b$. (5 marks)
- b). From the graph find the values of a and b , and write down the equation representing the graph. (3 marks)

SECTION E:**[20 MARKS]****Instruction:***Show all necessary working where applicable.*

1. Convert the following binary numbers to decimal numbers:
 - a). 11011_2 (3 marks)
 - b). 1011_2 (3 marks)

2. Convert the following decimal numbers to binary numbers:
 - a) 47_{10} (3 marks)
 - b) 29_{10} (3 marks)

3. Use an elimination method to solve the simultaneous equations:
$$3x + 4y = 5 \quad (1)$$
$$2x - 5y = -12 \quad (2)$$
(4 marks)

4. Solve $3x^2 - 11x - 4 = 0$ by using quadratic formula: (4 marks)

THE END