



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, 2014

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. $f = \frac{m}{t} (v - u)$
 - 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. $9x^2 - 25$ is equivalent to:
 - A. $(3x - 5)(3x + 5)$
 - B. $-5 - 3x^2$
 - C. $(3x - 25)^2$
 - D. $(3x - 5)(3x + 5)$

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. 2.68Ω
 - B. 400Ω
 - C. 473Ω
 - D. 3170Ω

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 correct?

- A. $24^\circ 33' 17'' = 24.555^\circ$
- B. $182^\circ 21' 32'' = 182.123^\circ$
- C. $56^\circ 12' 28'' = 56.666^\circ$
- D. $240^\circ 2' 45'' = 240.198^\circ$

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 cm^2
- B. 35.7 cm^2
- C. 36.1 cm^2
- D. 37.4 cm^2

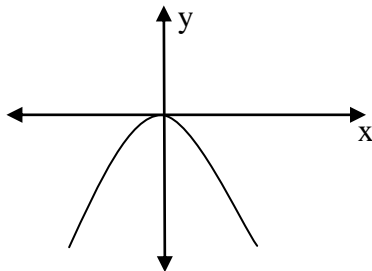
10. In the general sinusoidal equation $y = A\sin(\omega t \pm \alpha)$; the leading phase shift is represented as:

- A. $+\alpha$
- B. $-\alpha$
- C. $-$
- D. $+$

11. What is the surface area of a cube if the volume of the cube is 2401 cm^3 ?

- A. 178.11 cm^2
- B. 180.58 cm^2
- C. 179.31 cm^2
- D. 177.15 cm^2

12. Identify the given graph:



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

13. $Z_1 = 2 + j5$ and $Z_2 = 3 + j4$; choose the appropriate answer for $Z_1 - Z_2$:

- A. $-1 + j$
- B. $-5 + j9$
- C. $1 + j$
- D. $5 + j9$

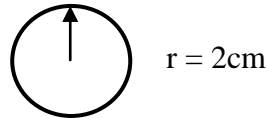
14. From the equation $3y = 9x - 7$, determine the gradient.

- 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 sphere shown below if the radius is 2 cm?



- A. $14\pi \text{ cm}^2$
- B. $16\pi \text{ cm}^2$
- C. $15\pi \text{ cm}^2$
- D. $13\pi \text{ cm}^2$

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.

- a) Transpose the formula to make
- f
- the subject.

$$V = u + \frac{ft}{m}$$

(2 marks)

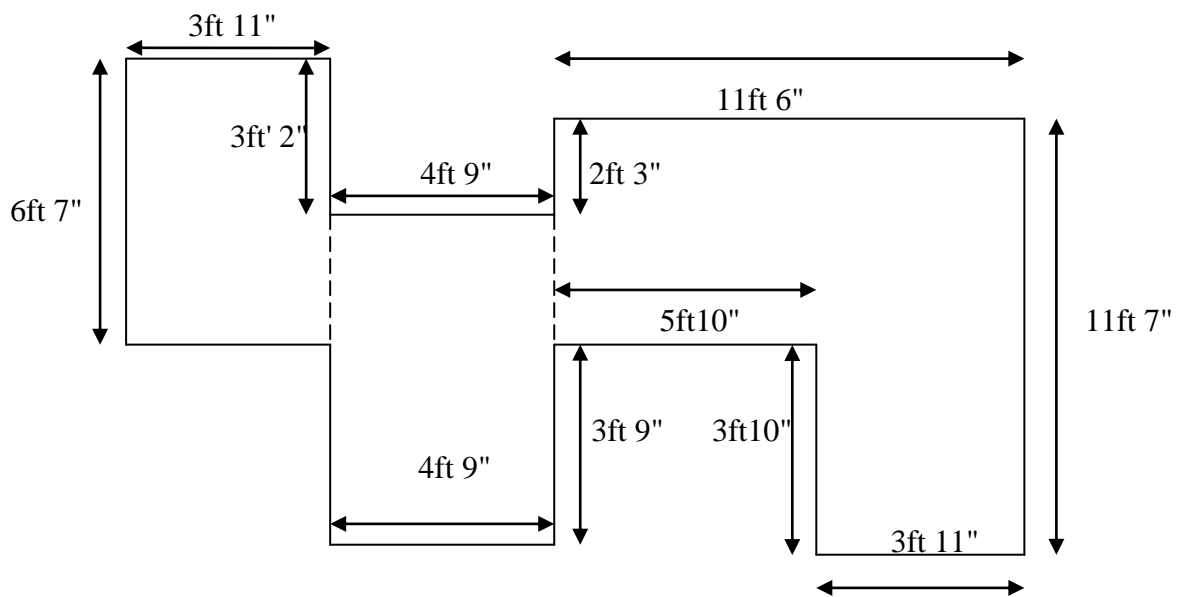
- b) Given that:

$$\frac{D}{d} = \sqrt{\frac{f+p}{f-p}}$$

Make p the subject of the formula and evaluate p when $f = 2$, $D = 4$ and $d = 3$.

(4 marks)

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



(6 marks)

3. Tank was full at odometer reading 45000 and is refilled with 10 gallons at an odometer reading of 50000.

Cost per gallon of regular fuel is \$2.73

Cost per gallon of premium fuel is \$3.10

- A. How many miles were travelled on one tank of fuel? (2 marks)
- B. What was the MPG? (2 marks)
- C. If the cost of fuel was \$31.00. What type of fuel was purchased? (2 marks)
- D. How many miles could this car be driven on 15 gallons of fuel? (2 marks)

SECTION C

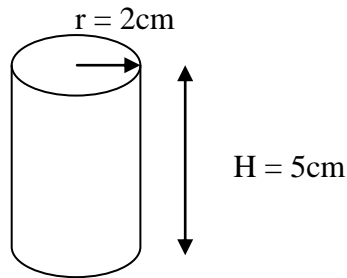
[20 MARKS]

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.

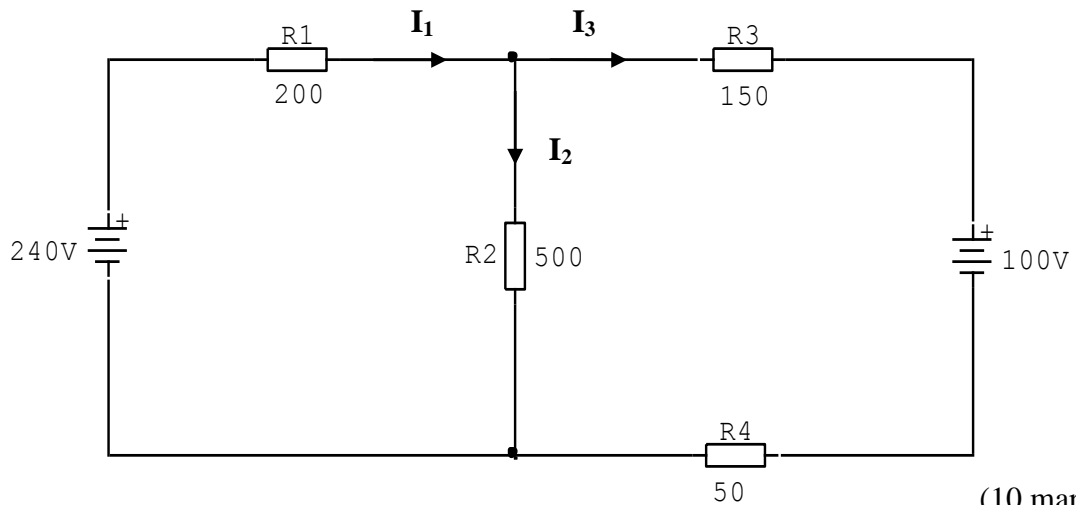
(3 marks)



2. If $i_1 = 8 \sin \theta$ and $i_2 = 4 \sin (\theta + \pi/4)$, find, by calculation, an expression for the resultant current represented by $i_1 + i_2$.

(7 marks)

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



(10 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. Plot the graph $y = 4x + 3$ in the range $x = -3$ to $x = +4$. Find
 - a) The value of y when $x = 2.2$ (1 mark)
 - b) The value of x when $y = -3$ (1 mark)

3. Determine the gradient of the straight line graph passing through the co-ordinates
 - a) $(-2, 5)$ and $(3, 4)$ (1 mark)
 - b) $(-2, -3)$ and $(-1, 3)$ (1 mark)

4. 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. (5 marks)

5. The following values of resistance R ohms and corresponding voltage V volts are obtained from a test on a filament lamp.

| | | | | | |
|---------|----|------|----|-----|-----|
| R ohms | 30 | 48.5 | 73 | 107 | 128 |
| V volts | 16 | 29 | 52 | 76 | 94 |

Choose suitable scales and plot a graph with R representing the vertical axis and V the horizontal axis. Determine

- a) The gradient of the graph. (2 marks)
- b) The R axis intercepts value. (1 mark)
- c) The equation of the graph. (2 marks)
- d) The value of resistance when the voltage is 60 V. (1 mark)

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

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

2. Convert the following decimal numbers 47_{10} to a binary number:
 - 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