



FIJI NATIONAL UNIVERSITY

COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 2

UNIT CODE: EEE327

TITLE: MATHEMATICS FOR TRADE 2

FINAL EXAMINATION – PENSTER 3, 2013

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 SECTION 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 a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. **ANSWER ALL QUESTIONS**
9. Show all working where necessary.
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.**

SECTION A**MULTIPLE CHOICE****[20 MARKS]**Circle the *letter* of the *best choice* in the **Answer Sheet** provided.

1. Transpose the formula: $a + b = c - d - e$, to make d the subject
 - A. $d = a - c - e + b$
 - B. $d = c - a - b - e$
 - C. $d = -c + a - b + e$
 - D. $d = c - a + b + e$

2. Solve: $10 + 3(r - 7) = 16 - (r + 2)$
 - A. -6.25
 - B. 6.05
 - C. 6.25
 - D. -6.05

3. $9x^2 - 25$ is equivalent to:
 - A. $(3x - 5)(3x + 5)$
 - B. $-5 - 3x^2$
 - C. $(3x - 25)^2$
 - D. $(3x - 5)(3x + 5)$

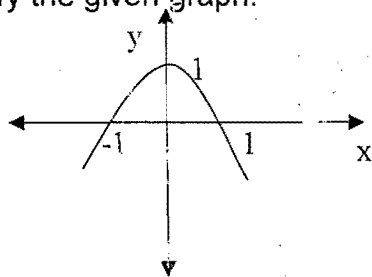
4. When two resistors R_1 and R_2 are connected in parallel the formula $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}$ is used to determine the total resistance R_t . If $R_1 = 470 \Omega$ and $R_2 = 2.7 \text{ k}\Omega$, R_t (correct to 3 significant figures) is equal to:
 - A. 2.68Ω
 - B. 400Ω
 -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

5. In hexadecimal, the decimal number 108_{10} is:
 - A. $6D_{16}$
 - B. $5C_{16}$
 - C. $6B_{16}$
 - D. $6C_{16}$

6. Identify the missing angle in a triangle; if one angle reads $45^\circ 29' 55''$, the other is $20^\circ 57' 15''$:
 - A. $66^\circ 27' 10''$
 - B. $113^\circ 28' 30''$
 - C. 113.5472222°
 - D. Both b) and c)

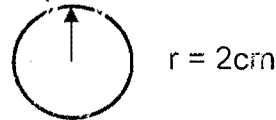
7. Which of the following is a Pythagorean Triad?
- A. 6, 12, 13
 - B. 12, 14, 15
 - C. 8, 15, 16
 - D. 6, 8, 10
8. Which of the following is correct?
- A. $24^\circ 33' 17'' = 24.555^\circ$
 - B. $182^\circ 21' 32'' = 182.123^\circ$
 - C. $56^\circ 12' 28'' = 56.666^\circ$
 - D. $240^\circ 2' 45'' = 240.198^\circ$
9. A rectangular plate is 75m long and 36m wide. Find its area in square centimeters.
- A. 27200000 cm^2
 - B. 27000000 cm^2
 - C. 36100000 cm^2
 - D. 37800000 cm^2
10. In the general sinusoidal equation $y = A \sin(\omega t \pm \alpha)$; the lagging 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 $2y = 16x - 5$; determine the gradient
- A. 16
 - B. 2
 - C. -5
 - D. 8
15. State the general name for the angle 55° .
- A. Acute angle
 - B. Right angle
 - C. Obtuse 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. Identify the type of triangle given below:
- A. equilateral triangle
 - B. right angle triangle
 - C. Scalene triangle
 - D. isosceles triangle
-
- A diagram of a scalene triangle with three unequal sides and three unequal angles.
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.

- 1a. Transpose the formula to make f the subject.

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

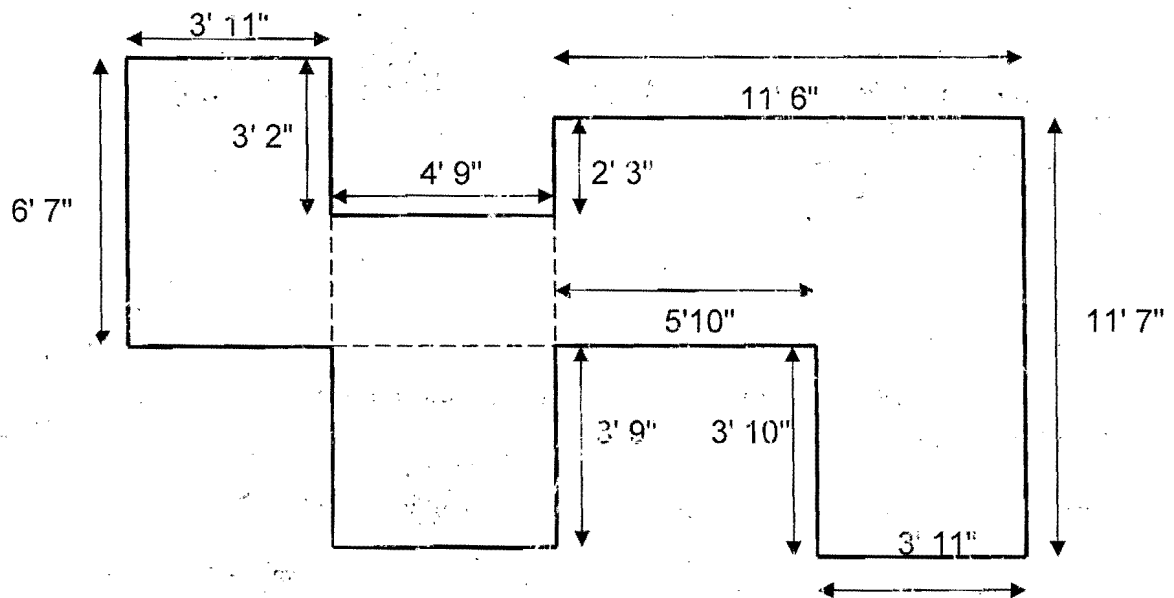
(2 marks)

- 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 37,250 and is refilled with 12 gallons at an odometer reading of 37,500.

Cost per gallon of regular fuel is \$1.00

Cost per gallon of premium fuel is \$1.20

- How many miles were travelled on one tank of fuel? (2 marks)
- What was the MPG? (2 marks)
- If the cost of fuel was \$14.40. What type of fuel was purchased? (2 marks)
- How many miles could this car be driven on 15 gallons of fuel? (2 marks)

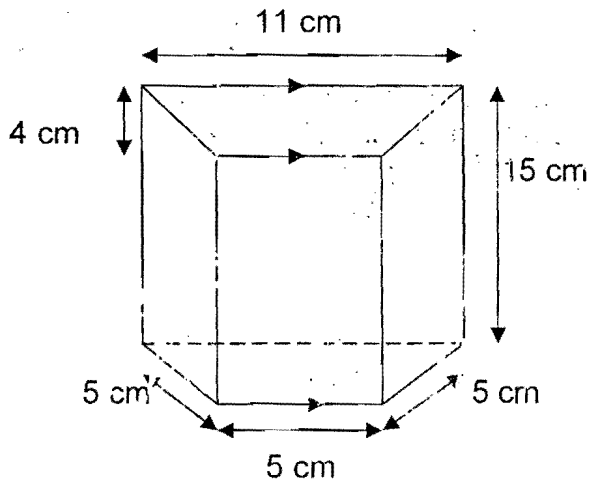
SECTION C

[20 MARKS]

Instruction:

Show all necessary working where applicable.

1. Calculate the volume and total surface area of the solid prism shown below.



(6 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 $i_1 + i_2$.

(8 marks)

3. When Kirchoff's laws are applied to the electrical circuit shown in Fig. 3.1 the currents I_1 and I_2 are connected by the equations:

$$27 = 1.5I_1 + 8(I_1 - I_2) \quad \text{eq 1}$$

$$-26 = 2I_2 - 8(I_1 - I_2) \quad \text{eq 2}$$

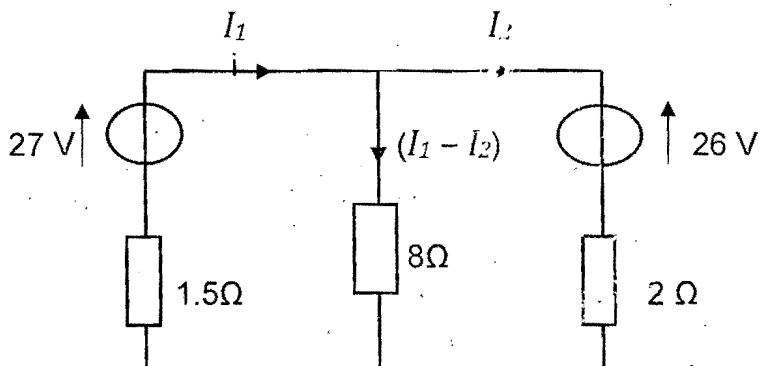


Figure. 3.1

- Solve the equations to find the values of currents I_1 and I_2 . (3 marks)

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

1. Sketch the graphs of:
 - a) $-2y = 8x - 6$ (2 marks)
 - b) $y = -2x^2 + 2$ (2 marks)
2. Determine the gradient of the straight line graph passing through the co-ordinates
 - a) (-2, 5) and (3, 4) (1.5 marks)
 - b) (-2, -3) and (-1, 3) (1.5 marks)
3. Two aircraft leave an airfield at the same time. One travels due north at an average speed of 300km/h and the other due west at an average speed of 220 km/h. Calculate their distance apart after 4 hours. (5 marks)
4. 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)
- e) The value of the voltage when the resistance is 40 ohms. (1 mark)
- f) If the graph were to continue in the same manner, what value of resistance would be obtained at 110 V? (1 mark)

SECTION E:

[20 MARKS]

Instruction:

Show all necessary working where applicable.

1. Convert the following binary numbers to decimal:
 - a). 101101_2 (3 marks)
 - b). 1110_2 (3 marks)

2. Convert the following decimal numbers to a binary number:
 - a) 39_{10} (3 marks)
 - b) 57_{10} (3 marks)

3. Acceleration of vector $a_1 = 1.5 \text{ m/s}^2$ at 90° and vector $a_2 = 2.6 \text{ m/s}^2$ at 145° act at a point.
Find:
 - a) $a_1 + a_2$ (2 marks)
 - b) $a_1 - a_2$ (2 marks)

4. Solve $4x^2 + 7x + 2 = 0$ giving the roots correct to 2 decimals. (4 marks)

THE END