



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 4, 2017

**ROOM: AS PER TIMETABLE
TIME: 2 HOURS & 10 MINUTES**

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.**

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

1. Exercise by making I the subject of $P = IV$
 - A) $I = V/P$
 - B) $I = P/V$
 - C) $I = VP$
 - D) All of the above

2. Exercise by solving: $20 + 6(r - 7) = 32 - 2(r + 2)$
 - A) -6.25
 - B) 6.05
 - C) 6.25
 - D) -12.05

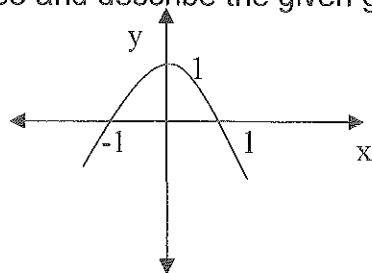
3. Compare if $x^2 - 25$ is equivalent to
 - A) $(x-5)(x-5)$
 - B) $-5 - x^2$
 - C) $(x+5)^2$
 - D) $(x-5)(x+5)$

4. When two resistors R_1 and R_2 are connected in parallel the formula $\frac{1}{R_t} = \frac{1}{R_1} + \frac{1}{R_2}$, exercise by calculating 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. Exercise and check which of the following is correct?
 - A) 1 revolution = 360 degrees
 - B) 1 minute = 60 degrees
 - C) 1 second = 60 minutes
 - D) 1 revolution = 60 degrees

6. Exercise and 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. Exercise and compare 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. Exercise and multiply $2a/3$ and $4b/5$
- A) $8ab/15$
 - B) $6ab/8$
 - C) $10a+12b/15$
 - D) $8ab/8$
9. A rectangular plate is 65m long and 46m wide. Exercise and calculate its area in square centimeters.
- A) 27600000 cm^2
 - B) 29900000 cm^2
 - C) 26000000 cm^2
 - D) 29250000 cm^2
10. In the general sinusoidal equation $y = A\sin(\omega t \pm \alpha)$; Exercise and identify the lagging phase shift abbreviation:
- A) $+\alpha$
 - B) $-\alpha$
 - C) $-$
 - D) $+$
11. Exercise in identifying the term that best describes one quarter of a whole circle:
- A) Chord
 - B) Sector
 - C) Quadrant
 - D) Segment
12. Exercise and describe the given graph:



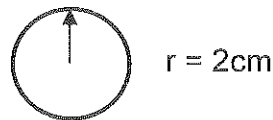
- A) $y = -x^2$
- B) $y = x^2$
- C) $y = -x^2 + 1$
- D) $y = -x^2 - 1$

13. Exercise in finding the crest factor for the graph $i = \sin \theta$ is:
- A) 1.414
 - B) 0.707
 - C) 1.11
 - D) 0.637

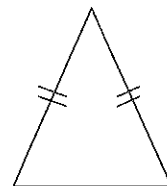
14. From the equation $3y = 18x - 9$, Exercise and identify the gradient.
- A) 18
 - B) 3
 - C) -9
 - D) 6

15. Exercise in stating the general name for the angle 50° .
- A) Acute angle
 - B) Right angle
 - C) Obtuse angle
 - D) Reflex angle

16. Exercise in calculating 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. Exercise and check 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. Exercise and compare what is the Argand of the following vector?
 $z = 2.5 + j4.5$
- A) 2.57
 - B) 5.15
 - C) 7.0
 - D) 25.6
19. Exercise and identify the type of triangle given below:
- A) equilateral triangle
 - B) right angle triangle
 - C) Scalene triangle
 - D) isosceles triangle



20. If $i_1 = 4\sin \theta$ and $i_2 = 6 \sin (\theta - \frac{\pi}{4})$, exercise and relate which of the following is Correct:
- A) i_2 leads i_1 by 45 degrees
 - B) i_2 lags i_1 by 45 degrees
 - C) i_2 lags i_1 by 40 degrees
 - D) i_1 and i_2 are in phase

SECTION B

[20 MARKS]

Instruction:

Show all necessary working where applicable.

1. Exercise and convert the following
- (a) 110011 to decimal [2 marks]
 - (b) 3AD2.4C to decimal [2 marks]

2. Exercise and find the value of R_1 , given $R=10$, $R_2=5$

$$R = \frac{R_1 R_2}{R_1 + R_2} \quad [4 \text{ marks}]$$

3. Exercise and convert 330.125 to binary [4 marks]

4. Given $z_1 = 2 \angle (-\pi/3)$ Exercise and convert z_1 in Cartesian form [4 marks]

5. Exercise and convert $29^\circ 12' 35''$ to degrees and decimals of a degree, to 3 decimals places. [2 marks]

SECTION C

[20 MARKS]

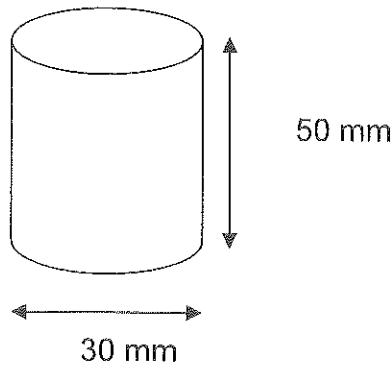
Instruction:

Show all necessary working where applicable.

1. A cylinder has a diameter 30 mm and height 50 mm.

Exercise and calculate:

- (a) Its volume in cubic centimeters, correct to 1 decimal place.
(b) The total surface area in square centimeters.



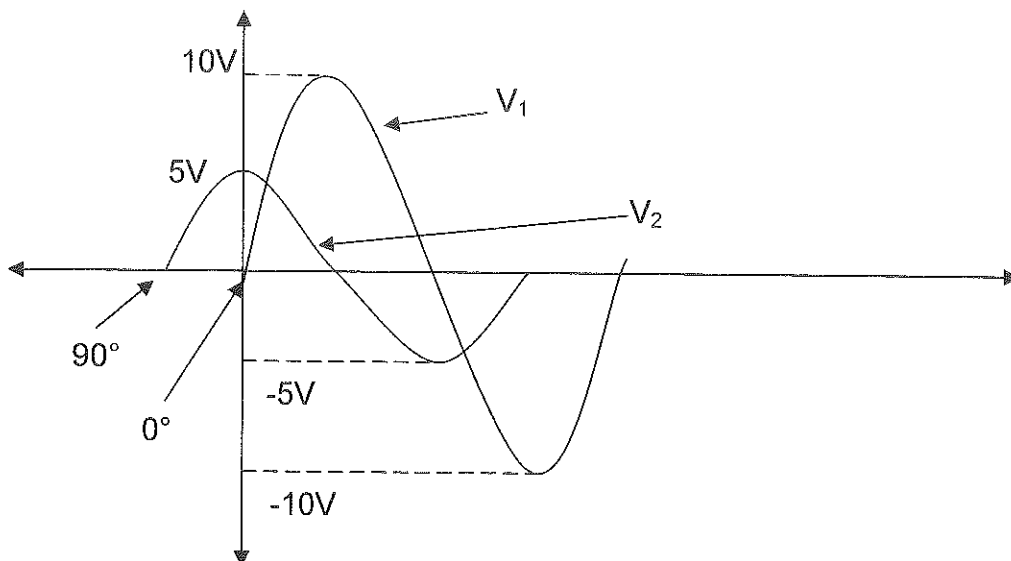
(6 marks)

2. If $I_1 = 6 \sin \theta$ and $I_2 = 8 \sin \left(\theta - \frac{\pi}{4} \right)$.

Exercise and find, by calculation, an expression for the resultant current represented by $i_1 + i_2$ and draw the waveform diagram for i_1 , i_2 and i_R .

(8 marks)

3. Exercise find the resultant voltage represented by $V_1 + V_2$ from the waveform below using phasor diagram.



SECTION D:

(6 marks)
[20 MARKS]

Instruction:

Show all necessary working where applicable.

1. Exercise and sketch the graphs of:
 - a) $-2y = 8x - 6$ (2 marks)
 - b) $y = -2x^2 + 2$ (2 marks)

2. Exercise and 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 ships leave a port at the same time. One travels due west at 18.4 km/h and the other due south at 27.6 km/h. Exercise and calculate how far apart the two ships are after 5 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. Exercise and 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. Exercise and convert the following binary numbers to decimal:
 - a). 110011_2 (3 marks)
 - b). 11011_2 (3 marks)

2. Exercise and convert the following decimal numbers to a binary number:
 - a) 47_{10} (3 marks)
 - b) 58_{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.
Exercise and find:
 - a) $a_1 + a_2$ (2 marks)
 - b) $a_1 - a_2$ (2 marks)

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

THE END