



**FIJI NATIONAL UNIVERSITY**

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

**SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING**

**CERTIFICATE III / IV IN ELECTRICAL AND ELECTRONICS ENGINEERING  
STAGE 2**

**EEC327- ELECTRICAL CALCULATIONS II  
FINAL EXAMINATION – QUARTER 3, 2019  
DURATION – 2 HOURS AND 10 MINUTES  
TOTAL NUMBER OF PAGES - 7  
TOTAL MARKS – 100**

**Day/Date: As per timetable Time: As per timetable 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 do the conversions of number systems.*
10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!**

**SECTION A****MULTIPLE CHOICE****[10 MARKS]****Instruction:**

*Write the appropriate alphabet beside each question number on your attached sheet.*

1. Make  $w$  the subject of  $e = w^2 + f t y^2$ 
  - a)  $w = \sqrt{(e - f y^2)}$
  - b)  $w = \sqrt{(e - t y^2)}$
  - c)  $w = \sqrt{(e - f t y^2)}$
  - d)  $w = \sqrt{(e - f t)}$
  
2. If the general equation for a linear graph is given by  $y = mx + c$ ; which component determines the slope?
  - a)  $y$
  - b)  $m$
  - c)  $x$
  - d)  $c$
  
3. How many minutes do you find in a degree?
  - a) 30
  - b) 600
  - c) 3600
  - d) 60
  
4. 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)  $+$
  
5. What is the surface area formula of a cube if the volume of the cube is  $l^3$ ?
  - a)  $l^2$
  - b)  $l_2$
  - c)  $l_3$
  - d)  $l^5$

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) Both A and B
- d)  $113.5472222^{\circ}$

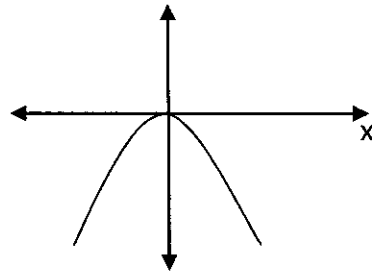
7.  $x^2 - 36$  is equivalent to:

- a)  $(x - 6)^2$
- a)  $(x - 6)(x - 6)$
- b)  $(x - 6)(x + 6)$
- c)  $-6 - x^2$

8. Name the quantity that has magnitude and direction:

- a) Litre
- b) Vector
- c) Mass
- d) Scalar

9. Identify the given graph:



- a)  $y = -x^2$
- b)  $y = x^2$
- c)  $y = x^2 + 1$
- d)  $y = -x^2 - 1$

10. Which of the following is not Pythagorean Triad?

- a) 8, 15, 17
- b) 6, 8, 10
- c) 13, 14, 15
- d) 5, 12, 13

11. To convert radians to degrees is:

- a) *Divide*  $\frac{\pi}{180}$
- b) *Multiply*  $\frac{\pi}{180}$
- c) *Divide*  $\frac{180}{\pi}$
- d) *Multiply*  $\frac{180}{\pi}$

12. State the general name for two angles whose sum is  $180^\circ$

- a) Reflex angle
- b) Supplementary angles
- c) Acute angle
- d) Obtuse angle

13. Identify the term that best describes one quarter of a whole circle:

- a) Chord
- b) Sector
- c) Quadrant
- d) Segment

14. Convert  $54_{10}$  to binary:

- a) 110100
- b) 110110
- c) 111000
- d) 5B

15.  $B_1 = 2+5q$  and  $B_2 = 6+2q$ ; choose the appropriate answer for  $B_1+B_2$ :

- a)  $8 + 7y$
- b)  $-11 + 7q$
- c)  $7 + 8q$
- d)  $8 + 7q$

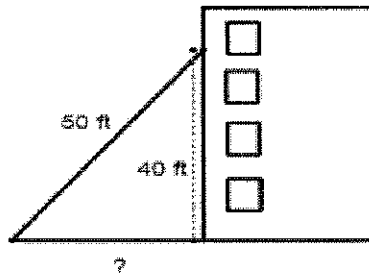
**SECTION B****SHOW ALL NECESSARY WORKING****[35 MARKS]**

1. Transpose the following:

a.  $k = \frac{1}{2}I\omega^2$  [Make 'ω' the subject of formula] (2 marks)

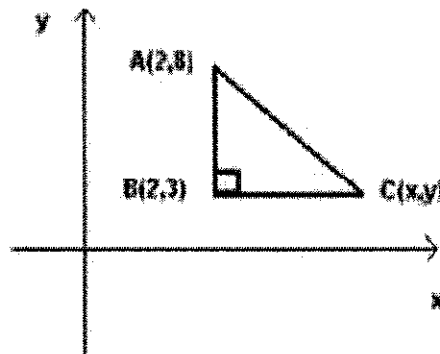
b.  $S = \frac{a}{1-r^2}$  [Make 'r' the subject of formula] (2 marks)

2. Given that 50 foot ladder rest against a window ledge that is 40 feet above the ground, find out how far is the ladder from the edge of the building?



(2 marks)

3. The right angle triangle shown below has an area of  $25\text{cm}^2$ . Find its hypotenuse.



(4 marks)

4. Add the following angular values: (4 marks)

a.  $120^\circ 55' 50''$  and  $20^\circ 10' 15''$

b.  $18^\circ 45' 12''$  and  $82^\circ 5' 15''$

5. Use elimination method to solve the simultaneous equations and find x:

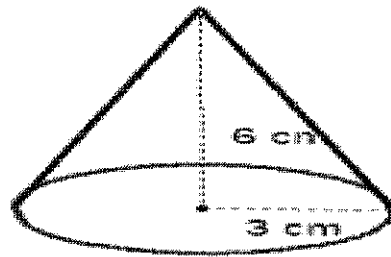
$$10x - 3y = 10 \quad (1)$$

$$8x + 4y = 8 \quad (2)$$

(4 marks)

6. Find the volume of the cone below.

(3 marks)



7. Mr. Wakanda wants to put down hardwood floors in his living room which is 4.0m by 3.0m. If the cost of hardwood flooring is \$10.00 per square meter, find the approximate cost not including labor to put down hardwood flooring in her living room.

(4 marks)

8. Convert the following angles to degrees and decimals of a degree, to 3 decimal places:

a.  $15^{\circ}11'18''$

b.  $24^{\circ}33'27''$

(4 marks)

9. Find the angle supplementary to the following:

a.  $120^{\circ}$

b.  $128^{\circ}45'50''$

(3 marks)

10. Convert the following to radians.

a.  $180^{\circ}$

b.  $330^{\circ}$

(3 marks)

### SECTION C

### SHOW ALL NECESSARY WORKING

**[50 MARKS]**

1. In an electrical alternating current circuit, the impedance  $Z$  is given by:

$$Z = \sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}$$

Transpose the formula to make  $C$  the subject and hence evaluate  $C$  when  $Z = 130$ ,  $R = 120$ ,  $\omega = 314$  and  $L = 0.32$ .

(6 marks)

2. If an angle of  $135^{\circ}$  is subtended by an arc of a circle of radius 8cm, find the length of:

a. The minor arc

b. The major arc, correct to 3 significant figures

(4 marks)

3. Factorize and solve the following quadratic equations.

a.  $4x^2 + 8x + 3 = 0$

b.  $x^2 + 2x - 8 = 0$

(4 marks)

4. Solve  $2x^2 + 8x - 4 = 0$  using Quadratic Formula and state the nature of roots. (4 marks)

5. Plot the graph of :

$$y = (x - 1)^2 + 2$$

(5 marks)

6. Find the gradient, co-ordinates of x-intercept, y-intercept and draw the graph for the following equation:

$$y = 3x + 2$$

(5 marks)

7. If  $i_1 = 8 \sin \theta$  and  $i_2 = 4 \sin (\theta + \frac{\pi}{4})$ .

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)

8. The law of connecting friction F and load L for an experiment is of a form  $F = aL + b$ , where a and b are constants. When  $F = 5.6$ ,  $L = 8.0$  and when  $F = 4.4$ ,  $L = 2.0$ .

a) Find the values of a and b

b) Find value of F when  $L = 6.5$ .

(8 marks)

9. Convert the following:

a.  $11011_2$  (Binary to Decimal)

b.  $1011_2$  (Binary to Decimal)

c.  $29_{10}$  (Decimal to Binary)

(6 marks)

THE END

*ALL THE BEST*