



FIJI NATIONAL UNIVERSITY

COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY

SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 1

EEE329- ELECTRICAL PRINCIPLES (TRADE) 1

FINAL EXAMINATION – TRIMESTER 1, 2016

TIME: 3 HOURS 10MINUTES

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]

1. Which of the following is not an electrical quantity?
 - A. Voltage
 - B. Current
 - C. Distance
 - D. Power

2. The quantity 43×10^{-3} is the same as:
 - A. 0.043
 - B. 0.430
 - C. 430
 - D. 43,000

3. An electric heater draws 3.5 A from a 110 V source. The resistance of the heating element is approximately
 - A. 385
 - B. 38.5
 - C. 3.1
 - D. 31

4. A resistor is connected across a 50 V source. What is the current in the resistor if the color code is red, orange, and orange, silver?
 - A. 2 mA
 - B. 2.2 mA
 - C. 214 mA
 - D. 21.4 mA

5. The output of a certain voltage divider is 12 V with no load. When a load is connected, the output voltage
 - A. decreases
 - B. increases
 - C. remains the same
 - D. becomes zero

6. Three 10 k resistors are connected in series. A 20 k resistor is connected in parallel across one of the 10 k resistors. The voltage source is 24 V. The total current in the circuit is
 - A. 900 A
 - B. 9 mA
 - C. 90 mA
 - D. 800 A

7. The conductive loop on the rotor of a simple two-pole, single-phase generator rotates at a rate of 400 rpm. The frequency of the induced output voltage is
- A. 40 Hz
 - B. 100 Hz
 - C. 400 Hz
 - D. indeterminable
8. In a three-phase system, the voltages are separated by
- A. 45°
 - B. 90°
 - C. 120°
 - D. 180°
9. In a delta-connected source driving a – delta connected load, the
- A. load voltage and line voltage are one-third the source voltage for a given phase
 - B. load voltage and line voltage are two-thirds the source voltage for a given phase
 - C. load voltage and line voltage cancel for a given phase
 - D. load voltage, line voltage, and source phase voltage are all equal for a given phase
10. When the speed at which a conductor is moved through a magnetic field is increased, the induced voltage
- A. increases
 - B. decreases
 - C. remains constant
 - D. reaches zero

SECTION B SHORT ANSWER QUESTIONS**[20 MARKS]**

1. Define the following terms: (4 marks)
 - A. Molecules
 - B. Atoms
 - C. Semiconductors
 - D. Conductors

2. In your own words explain what you understand by the term OHM's Law. Given that a motor draws 4A when powered by a 12V DC source, determine the resistance of the motor. (3 marks)

3. In a typical rural installation where Residential Tariff is used, a kWh meter established 310 755kWh. The previous monthly reading was 310 670 kWh. Use FEA Residential structure.
 - A. Calculate the cost of energy for the current month. (4 marks)
 - B. If the current monthly reading was as follows:

Electricity usage and service calculation

TARIFF DESCRIPTION	READING TYPE	METER NUMBER	READING		USAGE KWH	BILLED DAYS
			PRESENT	PREVIOUS		
Domestic	Estimated	SD028100:1	010279	010139	140	29

- Then what will be charge for that month. (4 marks)
4. Draw two [2] rectangles in a line with a small gap between them, representing two magnets. Mark the magnets as follows: [N – S][N – S]. Draw the magnetic field surrounding those magnets. (3 marks)

 5. What is a primary cell? Give one example (2 marks)

SECTION C SHORT ANSWER QUESTION**[35 MARKS]**

1. The value of an induced EMF depends on three factors. List down three factors and elaborate on it. (6 marks)

2. Two generators are available to generate the required 50Hz. Generator A has 4 poles and generator B has 2 poles. At what speed in RPM must each be driven to generate this frequency? (4 marks)

3. When the maximum value of an alternating current is 10A, determine:
 - A. Average value? (1 marks)
 - B. R.M.S. value? (1marks)
 - C. Peak value? (1 marks)
 - D. Peak – to – peak value (1marks)
 - E. Draw the waveform and label all values above. (3 marks)

4. A system running at a low power factor increases the current, which in turn leads to other disadvantages. Give two methods to improve power factor. (3 marks)
5. A single phase motor draws 2.7A on 240 V and a wattmeter in the circuit reads 486 W. Find the power factor. (4 marks)
6. Give two methods through which resonance can be achieved. (2 marks)
7. State four effects of low power factor? (4 marks)
8. True Power, apparent power and reactive power can be represented by a power triangle. Draw and label the power triangle. (5 marks)

SECTION D

SHORT ANSWER QUESTIONS

[35 MARKS]

1. Give three advantages of a three phase system over single-phase. (3 marks)
2. Compare between star and delta systems in terms of the following:
 - A. V_L (1 mark)
 - B. I_L (1 mark)
 - C. suitability of their usage (1 mark)
3. Three-coil each having a resistance of 28Ω and an inductive reactance of 35Ω are connected in delta to a 415V, 3 phase supply. Determine:
 - A. Phase current (2 marks)
 - B. Line current (1 marks)
 - C. Power factor (1 marks)
 - D. Total power (1 mark)
4. An inductor has a resistance of 30Ω and an inductance of 0.8H. If it's connected across a 240V 50Hz supply, find:
 - A. Its inductive reactance (1 mark)
 - B. Its impedance (1 mark)
 - C. The current flowing through the inductor (1 mark)
 - D. The phase angle between the current and the applied voltage (2 mark)
 - E. Draw the phasor diagram for current and voltage. (2 mark)
5. Draw the phasor diagram for the following:
 - A. Series R-C circuit (2 mark)
 - B. Series R-L circuit (2 mark)
 - C. Series R-L-C circuit (2 mark)

6. Three identical coils, each with resistance of 12 ohms and inductance of 38mH are connected in star to a 415 volts 50 hertz three phase supply, calculate
- A. Inductive reactance of each coil (2 marks)
 - B. Impedance of each phase (2 marks)
 - C. Phase current (1 mark)
 - D. Line current (1 mark)
 - E. Power (2 marks)
7. State the effects of broken neutral. (3 marks)

THE END