

**FIJI NATIONAL UNIVERSITY
COLLEGE OF ENGINEERING, SCIENCE AND TECHNOLOGY
SCHOOL OF BUILDING AND CIVIL ENGINEERING**

TRADE DIPLOMA PROGRAMME (TDB, TDLS, TDQS, TDCE, TDAT)

EEE460 INTRODUCTION TO ELECTRICAL AND ELECTRONIC ENGINEERING

EXAMINATION (TRIMESTER 1, 2014)

DATE/TIME/ROOM – Refer to Timetable

INSTRUCTIONS TO CANDIDATES

1. You are allowed 10 minutes extra time during which you are not to write.
2. Begin each answer on a fresh new page and use both sides of the sheets.
3. Write your identification number on the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc in their correct sequence and secure with string provided.
5. For all sheets of paper in which has been done, cross it through and you must attach to your answer script.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use the Answer Sheet in this Question Paper to answer Section A and Section B and attach to your Answer Booklet
8. *ANSWER ONLY SIX QUESTIONS IN SECTION C*

SECTION A – MULTIPLE CHOICE QUESTIONS**(20 MARKS)**

Choose only *ONE* correct answer from the choices given, Use the Answer Sheet attached at the back of this Question Paper and attach to your Answer Booklet.

1. However, the effect of electric shock on the body depends not only on the strength of the current, but on factors such?
 - (a) forward biasing voltage
 - (b) short circuit voltage.
 - (c) duration of the contact.
 - (d) reverse breakdown voltage.
 - (e) area of contact.

2. The best statement that describes and justifies the use of safety boots is :
 - (a) It is safe and protects your feet
 - (b) Its sole are electrically insulated and the steel toe cap protects the feet for falling objects
 - (c) It is manufactured in such a way that moisture cannot penetrate inside
 - (d) It is comfortable and makes working enjoyable
 - (e) It looks good and feels great

3. What is the unit for measuring resistance?
 - (a) farads
 - (b) ohms
 - (c) henrys
 - (d) pico
 - (e) nano

4. Which statement best describes a resistor ?
 - (a) Two terminal device used to vary the current in the circuit
 - (b) Three terminal device used to vary the voltage in a circuit
 - (c) A two terminal device that resist the flow of current.
 - (d) Two terminal device used for storing voltage.
 - (e) Four terminal device used as switch

5. Three resistors of 2Ω , 10Ω and 20Ω are connected in series to a 20V power supply. Which of the following statements is true?
 - (a) The total resistance will be 1.54Ω
 - (b) The voltage across each resistors will be 20V
 - (c) The current flowing in through the 20Ω resistor will be the same as the current flowing in the 10Ω one.
 - (d) The current will branch out somewhere in the circuit
 - (e) Total current will be 12.9A

6. Which of the following supports a parallel circuit?
- (a) The voltage will remain the same in each branch as of the main supply voltage
 - (b) The total resistance is the addition of all the resistor values
 - (c) Current thorough each branches will be the same
 - (d) Total power consumed will be the same as the power consumed by the highest resistor
 - (e) The total current will equal to the current flowing through the highest resistor

7. What is a capacitor?

- (a) Two terminal device used to vary the current in the circuit
- (b) Three terminal device used to vary the voltage in a circuit
- (c) A device that stops the flow of current.
- (d) Two terminal device used for storing voltage.
- (e) Four terminal device used as switch.

8. What is a resistor?

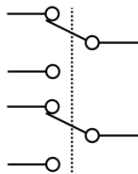
- (a) Two terminal device used to vary the current in the circuit
- (b) Three terminal device used to vary the voltage in a circuit
- (c) A two terminal device that resist the flow of current.
- (d) Two terminal device used for storing voltage.
- (e) Four terminal device used as switch

9. An actuators is?

- (a) type of device used in military
- (b) type of switch for controlling speed
- (c) type of motor for moving or controlling...
- (d) type of switch used in big transport
- (e) type of memory buffer

10. What type of switch does the following circuit symbol represent?

- (a) DPST
- (b) SPDT
- (c) SPST
- (d) SPTT
- (e) DPDT

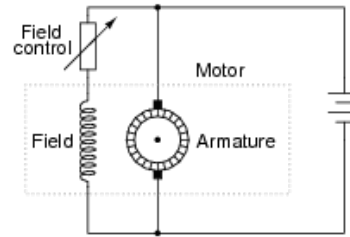


11. What is the correct way of reversing the rotation of a dc motor?

- (a) Interchange the polarity of the field or the armature but not both
- (b) Interchange both the polarity of the field and the armature
- (c) Change the winding of both the armature and the field
- (d) Reducing the supply voltage
- (e) Increasing the supply current

12. For the circuit motor symbol shown on the right, identify which type of dc motor is being represented?

- (a) Permanent magnet
- (b) Shunt Field
- (c) Series Field
- (d) Compound
- (e) Induction



13. A step up transformer.....?

- (a) Controls the output
- (b) Split the voltages into two phase
- (c) Decrease the voltages
- (d) Increase the voltages.
- (e) Decrease the current

14. A step down transformer.....?

- (a) Controls the output
- (b) Split the voltages into two phase
- (c) Decrease the voltages.
- (d) Increase the voltages.
- (e) Decrease the current

15. What is the purpose of filter circuits in a power supply circuit?

- (a) inverts dc to ac voltage
- (b) converts pulsating dc to filtered dc voltage
- (c) blocks ac voltages and allow dc voltage
- (d) converts pulsating ac to filtered ac voltage
- (e) inverts ac to dc voltage

16. Zener diodes is most commonly used as a :

- (a) decoupling device
- (b) current breaker.
- (c) voltage amplifier.
- (d) voltage regulator .
- (e) current coupling .

17. Output Voltages ranges.... “Logic High” or 1.....?

- (a) 2.5 – 5v
- (b) 1 – 2v
- (c) 0 – 1v.
- (d) 2 – 5v
- (e) 0.4 – 2.5v

18. Which of the following device is best suited for voltage regulation?
- (a) AND gate
 - (b) inductor.
 - (c) OR gate.
 - (d) inverter.
 - (e) Zener diode.
19. To overcome the barrier potential at the P-N junction, a small voltage is required to switched on the diode, what is the name of this voltage?
- (a) forward biasing voltage
 - (b) short circuit voltage.
 - (c) breakdown voltage.
 - (d) reverse breakdown voltage.
 - (e) leakage voltage.
20. In a parallel inductive circuit of 60mH, 30mH and 20mH with 12v battery, what is the total inductance of the circuit ?
- (a) 12mH.
 - (b) 47mH.
 - (c) 10mH.
 - (d) 22mH.
 - (e) 79mH.

SECTION B – MATCHING AND FILL IN BLANKS**(20 MARKS)****SECTION B1 MATCHING (10 MARKS)**

Match the items on the left to the correct answers on the right column.

Circle the correct letter on the Answer Sheet provided.

1	Conventional Current Flow	A	Cannot conduct electricity and heat
2	Electron Flow	B	Switch operated by another electrical circuit
3	Resistors in Series	C	Negative to Positive in a circuit
4	Insulators	D	Part of power supply
5	Relay	E	Addition of all resistors
6	Permanent Magnet DC motors	F	Uses 1 and 0 signals
7	Transformer	G	Positive to Negative in a circuit
8	Regulator	H	Uses sinusoidal waveform signals
9	Digital	I	Does not use electromagnetism
10	Analogue	J	Energy transfer device

SECTION B2 FILLING IN BLANKS (10 MARKS)

Use the following words to make the statements below correct. Write the word beside the number in your answer booklet.

Wordlist – Rectifier, Voltmeter, kilowatt-hour, Parallel, Load, Voltage, kilo Watt, Secondary, Joules, Energy

- (a) The difference in potential between any two points is called the _____ (1) and is measured using an instrument called _____ (2)
- (b) _____ (3) is the ability to do work. It is measured in _____ (4)
- (c) The unit for electrical energy is _____ (5) and is measured in _____ (6)
- (d) A dc shunt motor is a motor whose field windings are connected in _____ (7) with the armatures.
- (e) The _____ (8) side of the transformer is usually connected to the _____ (9)
- (f) A device that can transform AC to DC is called _____ (10)

Choose only SIX (6) Questions out of the Nine (9) Questions

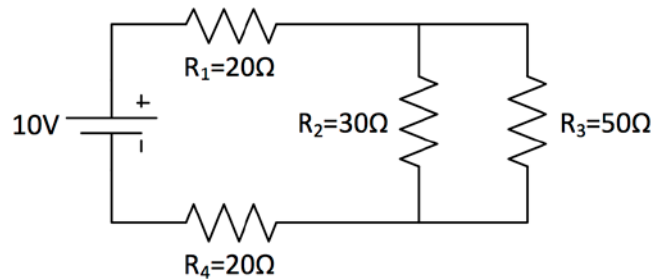
QUESTION 1

Four resistors of 10Ω , 20Ω , 100Ω and 5Ω are connected in parallel across a $24V$ dc battery :

- Draw the circuit diagram of this set up (2 marks)
- What is the current flowing in each branch of the circuit? (4 marks)
- Find the total current (1.5 marks)
- What is the total power consumed by the circuit in Watts? (1.5 marks)
- What would have been the total resistance if the resistors were connected in series? (1 mark)

QUESTION 2

Consider the combination series/parallel circuit shown below and answer the questions that follow :



- Calculate the total resistance of this circuit. (3 marks)
- What is the current supplied by the battery? (1.5 marks)
- What is the current flowing in both the 20Ω resistor? (1.5 marks)
- What is the power consumed by the 20Ω resistor? (1 mark)
- Fully state Ohm's Law. (3 marks)

QUESTION 3

Briefly explain the construction and function of the following electronic devices:

- Capacitors (2 marks)
- Resistors (2 marks)
- Inductors (2 marks)

Calculate the value and the % tolerance of the following 4-band resistors :

- Blue, Blue, Green, Silver (2 marks)
- Yellow, Green, Black, Gold (2 marks)

QUESTION 4

- 4.1 Explain with the aid of a diagram how the principle of *electromagnetism* is applied in the construction of relays. (4 marks)
- 4.2 Briefly explain how a linear actuator works. Show a sketch to elaborate your answer. (4 marks)
- 4.3 For the following types of switches, draw the circuit symbol :
- (a) SPST (Single Pole Single Throw) (1 mark)
- (b) DPST (Double Pole Single Throw) (1 mark)

QUESTION 5

- 5.1 Explain the main difference in terms of *circuit diagram* and *speed vs load current* characteristic curve between series excited dc motors and shunt field motors. (10 marks)

QUESTION 6

- 6.1 Draw the construction diagram of a transformer on no load and explain what happens when the primary winding is connected to the supply. (8 marks)
- 6.2 Calculate the secondary voltage of a transformer if it has the following parameters :
- Number of Primary Coil = 1000, Number of Secondary Coil = 1500, Primary Voltage = 10V (2 marks)

QUESTION 7

- 7.1 Draw the flow diagram of a basic power supply and briefly explain the main processes that takes place before a good clean DC voltage is produced. (8 marks)
- 7.2 Briefly explain why a zener diode is best suited for the regulation of dc voltage. (2 marks)

QUESTION 8

- 8.1 Explain what Flip Flops are and explain the timing diagram for JK flipflop. (5 marks)
- 8.2 Explain how a PN junction diode operates (5 marks)

QUESTION 9

- 9.1 The following illustrates current carrying conductors. Draw the magnetic field lines around it. (Use the right hand screw rule) (2 marks)
- 9.2 Explain by illustrating what happens when a current carrying conductor is introduced in between 2 opposing poles of a magnet. (Use the Fleming's Left Hand Rule) (5 marks)
- 9.3 Calculate the torque in newton metres (n-m) in a 6 pole machine which produces magnetic flux of 300 webers, an armature current of 2.5 A, 12 effective number of armature conductors, lap wound. (Use $T = p\phi IZ/2\pi a$) (2 marks)
- 9.4 State the function of the brushes in the motors? (1 mark)

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ANSWER SHEET (TO BE ATTACHED TO YOUR ANSWER BOOKLET)

SECTION A (MULTIPLE CHOICE), CIRCLE CORRECT ANSWER

Q1	A	B	C	D	E
Q2	A	B	C	D	E
Q3	A	B	C	D	E
Q4	A	B	C	D	E
Q5	A	B	C	D	E
Q6	A	B	C	D	E
Q7	A	B	C	D	E
Q8	A	B	C	D	E
Q9	A	B	C	D	E
Q10	A	B	C	D	E
Q11	A	B	C	D	E
Q12	A	B	C	D	E
Q13	A	B	C	D	E
Q14	A	B	C	D	E
Q15	A	B	C	D	E
Q16	A	B	C	D	E
Q17	A	B	C	D	E
Q18	A	B	C	D	E
Q19	A	B	C	D	E
Q20	A	B	C	D	E

SECTION B1 (MATCHING)

Q1		
volQ2		
Q3		
Q4		
Q5		
Q6		
Q7		
Q8		
Q9		
Q10		

SECTION B2 (FILLING IN BLANKS)

Q1	
Q2	
Q3	
Q4	
Q5	
Q6	
Q7	
Q8	
Q9	
Q10	