



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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: DIPLOMA IN ELECTRONIC ENGINEERING (STAGE 1)

UNIT CODE: EED400

TITLE: ELECTRICAL PRINCIPLES

FINAL EXAMINATION – SEMESTER 1, 2019

ROOM: AS PER TIMETABLE

TIME: 3 HOURS 10 MINUTES

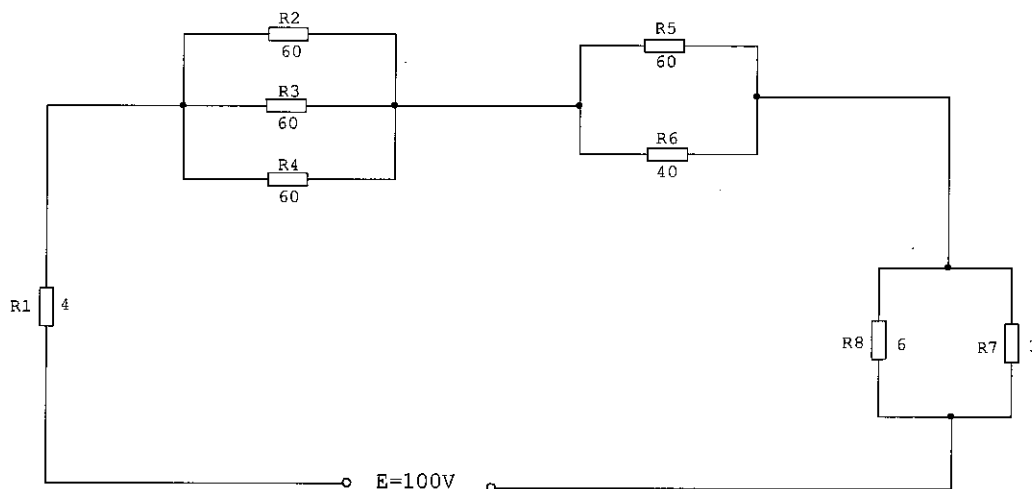
TOTAL MARKS:100

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**[30 MARKS]**

1. Draw the electrical shock path if a person is in contact with the energised circuit and explain what you will do if a person is shocked or burned by electricity. (6 marks)
2. In an Electrical workshop, 3 lights of 100 watts each and 2 electric fans of 20 watts each were used for 10 hours per day. The technician used lights and fans for 5 days. If a unit costs 33 cents then what will be the total cost in dollars for 5 days? (4 marks)
3. Define the following terms and give examples of each:
 - a) Molecules (1.5marks)
 - b) Matter (1.5marks)
4. State how many atoms are contained in each of the following molecule?
 - a) H_2O (1.5marks)
 - b) H_2SO_4 (1.5marks)
5. For the circuit shown below calculate:



- a) Total resistance of the circuit (2 marks)
 - b) Total current of the circuit (1 mark)
 - c) Total power consumption by the circuit (1 mark)
 - d) Current through R_2 (2 marks)
 - e) Power dissipated through R_2 (2 mark)
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6. When the maximum value of an alternating current is 30A, determine:
 - a) Average value? (1 marks)
 - b) R.M.S. value? (1 marks)
 - c) Peak value? (1 marks)
 - d) Peak – to – peak value (1 marks)
 - e) Draw the waveform and label all values above. (2 marks)

SECTION B**[30 MARKS]**

1. Sketch the magnetic fields for the magnetic arrangement in the diagrams shown below.



(2 marks)

2. Determine the value of the following resistors using color code (4 marks)
- Red red black gold
 - brown green black yellow red
 - Blue red black brown brown
 - Grey orange black orange red
3. Determine the value of the following resistors using color code (3 marks)
- $2.7\text{k}\Omega \pm 2\%$ (5 band)
 - $3.9\Omega \pm 5\%$ (4 band)
4. Find the resistance of a copper cable 95m in length if it has a diameter of 2mm.
The resistivity of copper is $1.72 \times 10^{-8} \Omega\text{m}$. (2 marks)
5. A 20Ω resistor is connected in parallel with an inductance of 2.387mH across a 60V, 1 kHz supply. Calculate
(a) the current in each branch,
(b) the supply current,
(c) the circuit phase angle,
(d) the circuit impedance, and
(e) the power consumed (1 mark each)
6. Find the total capacitance value of a $1\mu\text{F}$, $68\mu\text{F}$ and $220\mu\text{F}$ capacitors if it is connected in
a. Series
b. Parallel
c. Find the Total charge in series and in parallel given a voltage of 50V (6 marks)
7.
a. What is a Thermostat and what is it used for? (2 marks)
b. What is a Thermistor and what is it used for? (2 marks)
c. What are Thermocouples and what are they used for? (2 marks)
8. What is the basic principle of a right hand screw rule and Fleming's right hand rule indicates using diagrams. (2 marks)

SECTION C**[40 MARKS]**

1. Explain why A.C machines are rated in K.V.A and not in K.W. (3 marks)
2. 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. (2 marks)
3. State four effects of low power factor? (4 marks)
4. True Power, apparent power and reactive power can be represented by a power triangle. Draw and label the power triangle. (5 marks)
5. When connected to a three phase motor, two wattmeter's gave readings of 5 KW, and -1 KW, Calculate
 - a) Total power
 - b) Power factor, assuming balance load. (4 marks)
6. A welding plant set draws 30A from a 400V AC supply at a pf of 0.5 lagging. Calculate:
 - a) the kVA of the plant
 - b) the power in kW (3 marks)
 - c) the Kvar of the plant
7. Give three advantages of a three phase system over single-phase. (3 marks)
8. Draw the three phase wave form from 0 – 360 degrees. (2 marks)
9. Compare the two types of three phase connections. Mention at least five (4) points in each case. (4 marks)
10. Three coils each having resistance 3Ω and inductive reactance 4Ω are connected (i) in star and (ii) in delta to a 415V, 3-phase supply. Calculate for each connection
 - a) the line and phase voltages and (3 marks)
 - b) the phase and line currents. (3 marks)
11. 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
 - b) Impedance of each phase
 - c) Phase current
 - d) Line current (4 marks)-

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TABLE

Gold	—	10^{-1}	±5%
Brown	1	10	±1%
Orange	3	10^2	—
Green	5	10^3	±0.5%
Violet	7	10^7	±0.1%
White	9	10^9	—
None	—	—	±2%

