**BINGHAM UNIVERSITY**

**FACULTY OF SCIENCE AND TECHNOLOGY**

**PHYSICS DEPARTMENT**

**Amnesty Examination; 2020/2021 SESSION**

**PHY 202 – Electric Circuits and Electronics**

**Credit Unit: 2**

**Time Allowed: 2 hours**

**Instruction: Answer any one from the two questions in section A and any two questions from the three questions in section B. Mark for each question is 20. Total mark for the examination is 70.**

**Section A**

**1. (a) i.** State any of the Kirchhoff’s laws for electric circuits. [4 marks]

**(b)** Apply these laws to find the unknown current **I1**, resistance **r**, and e.m.f. **E** shown in Fig. 1 below. [10 marks]

12 V

r

E

1 Ω

1 A

3 Ω

I1

2 A

Fig. 1

**(c)** **i.** Briefly explain why transformers won’t work with steady direct current. [2 marks]

**ii.** How is Eddy currents minimized in transformers? [2 marks]

**ii.** Why is electricity leaving the power station “stepped up” to a very high voltage (lower current) by a transformer before being fed into the transmission line? [2 marks]

**2. (a) i.** State the laws (Faraday’s and Lenz’s) of electromagnetic induction. [4 marks]

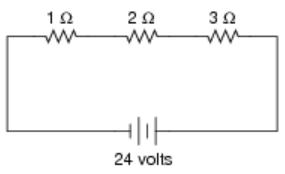
**ii.** Write the equation for the laws and state what each symbol represents. [4 marks]

**(b)** Explain why the input to the transformer is an alternating voltage, rather than a constant voltage. [3 marks]

**(c)** Fig. 2 shows a battery of e.m.f. 24 V connected in series with three resistors. Calculate:

**i.** the voltage drop across the 3Ω resistor. [6 marks]

**ii.** the power dissipated by the 2Ω resistor. [3 marks]

Fig. 2

**Section B**

**1. (a)** What is Biasing? Briefly explain the operation of p-n junction diode under the reverse bias condition. [6 marks]

**(b)** Give five differences between the Bipolar Junction Transistors (BJT) and the Field Effect Transistors (FET). [10 marks]

**(c)** Differentiate between Intrinsic and Extrinsic semi-conductor. [4 marks]

**2.** **(a)** What is doping in fabrication process? Explain how an p-type material can be formed through this process. [9 marks]

**(b)** Name and draw diagram of the most used configuration of npn transistors? Give reasons for its common usage. [5 marks]

**(c)** With labeled examples distinguish between covalent and electrovalent bonds. [6 marks]

**3** **(a)** Distinguish between the three types of solids using the Energy band model. [10 marks]

**(b)** Briefly explain the following terms: i) Full-wave rectification ii) Negative ionization iii) Holes [6 marks]

**(c)** Draw the common collector configuration of the bipolar junction transistor. [4 marks]