## SECTION III (1 HOUR)

### OPTIONS

*Answer any two of the four options*

### OPTION 1: ENERGY RESOURCES AND EIWIRONMENTAL PHYSICS.

8. (a) State two advantages of nuclear fusion over nuclear fission as sources of energy. **(2 marks)**

(b) Biomass, solar energy, and hydroelectricity are some energy sources from which functional energy could be obtained.

(i) What is meant by functional energy?

(ii) Choose any two of the above sources and briefly explain how functional energy could be obtained from them in Cameroon. **(5 marks)**

(c) The power derived from a windmill is given by the equation,

$P = \frac{\rho A v^3}{2}$

where $\rho$ is the average air density, A is the area of the blades and v is average wind speed. One such aero-generator has a blade diameter of 6.0 m. Given that the efficiency of the system is 25 % at a wind speed of 13.5 m s$^{-1}$.

(i) Calculate the power output of the aero- generator. Assume the average density of the air to be 1.2 kg m$^{-3}$. **(3 marks)**

(ii) Why is the efficiency of the system less than 100 %? **(2 marks)**

(d)

(i) Name a substance which is responsible for the depletion of the ozone layer. **(1 mark)**

(ii) State and explain the impact of the depletion of the ozone layer on the environment. **(2 marks)**

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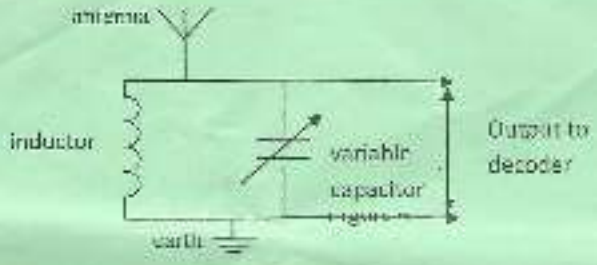
### Option 2: COMMUNICATION.

9. (a) A radio station uses a **carrier frequency** of 200 KHz to transmit an **amplitude-modulated** wave. The transmission consists of audio signals within the frequency range 50 Hz - 9 kHz.

(i) Explain the meaning of the bolded phrases.

(ii) Calculate the minimum and the maximum frequency sidebands and the bandwidth. **(4 marks)**

(b) Figure 4 shows a simple tuning radio circuit.




(i) Explain how the tuning circuit functions.

(ii) Given that the coil used has an inductance of 4.0 mH, calculate the value for the capacitor required to tune into the broadcast described in 9(a) above. **(4 marks)**

(iii) What is the use of the decoder in this circuit? **(2 marks)**

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(c)

(i) State three advantages which digital transmission has over analogue transmission.

(ii) Explain how several telephone conversations can be transmitted at the same time along a single optical fibre.

(5 marks)

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**OPTION 3: ELECTRONICS**

10. (a) (i) What is meant by thermionic emission? (2 marks)

(ii) Distinguish between n-type and p-type semiconductors. (2 marks)

(b) You are given two circuits consisting of:

(i) A resistor of 500 Ω and a capacitor connected in series to 9.0 V dc supply.

(ii) An inductor and a resistor of 500 Ω connected in series to 9.0 V dc supply.

Sketch current-time graphs for these circuits and explain the differences between them. (4 marks)

(c) (i) Explain how a transistor is used as a switch. (4 marks)

(ii) State in words and in the form of a truth table, the action of an OR logic gate with two inputs. (3 marks)

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**OPTION 4: MEDICAL PHYSICS**

11. (a) (i) Draw a simple diagram of the human eye, showing clearly the parts which enable the eye to form an image of an object. (3 marks)

(ii) Name any two eye defects, explaining how each defect manifests and explain how each defect may be corrected. (3 marks)

(b) X-rays and ultrasound are two techniques used for imaging of parts of the human body.

(i) State one part of the body where each of the techniques would be more suitable than the other. (2 marks)

(ii) Explain why ultrasound is not likely to replace X-rays completely for medical diagnosis. (3 marks)

(c) Explain how the Magnetic Resonance (MR) Scanner produces a visual image of a cross-section of a part of the body of a patient under examination. (4 marks)

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