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**NATIONAL OPEN UNIVERSITY OF NIGERIA**

**PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA**

**FACULTY OF SCIENCES**

**DEPARTMENT OF PURE AND APPLIED SCIENCE**

 **JANUARY/FEBRUARY2018 EXAMINATION**

**COURSE CODE: PHY 308**

**COURSE TITLE: ELECTRONICS I**

**CREDIT UNIT 2**

**TIME ALLOWED (2 HRS)**

**INSTRUCTION: Answer question one and any other 3 questions**

**QUESTION 1**

1. a) What is an Amplifier? List its main properties. (4 marks)

 b) List the “Classes” of amplifier and give examples of each type. (4 marks)

 c) Determine the input power, output power and circuit efficiency of a Class B amplifier providing a 30 V peak signal to a 20 Ω (speaker) and a power supply of Vcc = 35 V. (4 marks)

d) Mention the elements of a two-junction transistor (Bipolar Junction Transistor) (4 marks)

(e) In a tabular form, describe the behavior of a bipolar transistor in various circuit configurations to produce different circuit characteristics with regards to Input impedance, Output impedance and Gain. (4 marks)

(f) List the factors on which h-parameter depends. (5 marks)

2. a) Explain briefly the terms given below when they are associated with a p-n junction:

(i) conduction in intrinsic semiconductors (2 marks)

(ii) majority and minority carriers, and (2 marks)

(iii) diffusion (2 marks)

(b) Explain briefly why a junction between p-type and n-type materials creates a contact potential. (2 marks)



**Vin**

**Vout**

**5.0k**Ω

**10 k**Ω

Fig. 1

2. (c) Fig. 1 shows an amplifier circuit.

(i) What is its voltage gain *A*0? (3 marks)

(ii) What is the output voltage when the input voltage is

(a) +0.5 V (2 marks)

 (b) -1.3 V. (2 marks)

3.(a) An amplifier circuit for a microphone is shown in Fig. 2 above.

(i) Name the type of feedback used with this op-amp. (3 marks)

(ii) The output potential difference *V***OUT** is 5.8 V for a potential difference across the resistor R of 69 mV. Calculate:

(b) the gain of the amplifier circuit, (4 marks)

(c) the resistance of resistor X. (4 marks)

(d) State one effect on the amplifier output of reducing the resistance of resistor X.(4 marks)



**Fig.2**

4. (a) State the conditions for a Bipolar Junction Transistor operating in each of the following regions a. Cutoff Region b. Active Region c. Saturation Region (6 marks)

(b) For the fixed-bias configuration of fig 3, determine the following;

 (i) IBQ and ICQ ( 3 marks)

(ii) VCEQ VB and (3 marks)

(iii) VC and VBC (3 marks)





**2**

**Fig.4**

**Fig.3**

5.a) List the main properties of an Operational Amplifiers. (5 marks)

 (b) A differential amplifier has an open-loop voltage gain of 120. The input signals are 2.45 V and 2.35 V. Calculate the output voltage of the amplifier. (5 marks)

 (c) Determine the common-mode gain of an op amp that has a differential voltage gain of 150 ð 103 and a common-mode rejection ratio (CMRR) of 90 dB. (5 marks)