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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**

 **APRIL/MAY, 2019 EXAMINATIONS**

**COURSE CODE: PHY 308**

**COURSE TITLE: ELECTRONICS I**

**CREDIT UNIT 2**

**TIME ALLOWED (2 HRS)**

**INSTRUCTION: *Answer question 1 and any other three questions***

**QUESTION 1**

a) Define the following terms:

 i) amplifier (3 marks)

 ii) amplifier gain (3 marks)

 iii) amplifier efficiency (3 marks)

 bi) List five factors on which the $h$-parameters depend on. (5 marks)

 ii) Give the mathematical equation for determining each $h$-parameter. (4 marks)

 c) Calculate the oscillation frequency for the transistor Hartley oscillator circuit, given

 the following circuit values:$L\_{RFC}=0.5 mH$, $L\_{1}=750 μH$, $L\_{2}=750 μH$, $M=150 μH$

 and $C=150 pF$. (3 marks)

 d) A half-wave rectifier has a peak output voltage of $12.2 V$ at $50 Hz$ and feeds a resistive load of

 $100 Ω$. (i)Determine the value of the shunt capacitor to give $1 \%$ ripple factor (2 marks)

 (ii) the resulting dc voltage across the load resistor (2 marks)

**QUESTION 2**

a) Determine the Voltage, Current and Power Gain of an amplifier that has an input signal of $1 mA$ at $10 mV$ and a corresponding output signal of $10 mA $at $1 V$. Also express all three gains in decibels, $dB$. **(7 marks)**

b) List the classes of amplifier operations and state the equations for calculating the output (ac) power and the efficiency of class B. **(8 marks)**

**QUESTION 3**

a)The optimum load resistance for a certain transistor is $200 Ω$. What is the turns ratio $\left(\frac{N\_{1}}{N\_{2}}\right)$ of the transformer required to couple an $8 Ω$ load speaker to the transistor? Compute the overall efficiency of a transformer-coupled with Class A amplifier having$V\_{CE\left(max\right)}=27 V$and $V\_{CE\left(min\right)}=3 V$. **(6 marks)**

b) For a Class B amplifier providing a $15 V$ peak signal to $12 Ω$ (speaker) and a power supply of $V\_{cc}=30 V$, determine the input power, output power and circuit efficiency. **(9 marks)**

**QUESTION 4**

a) List the three elements of the two-junction transistor and consequently draw the construction and

 circuit symbols for NPN and PNP transistors. **(9 marks)**

b) An NPN transistor has a DC current gain, $=200$ . Calculate the base current $I\_{B}$ required to switch a

 resistive load of $4 mA$.Hence, find the value of the base resistor $R\_{B}$required to switch the load “ON”

 when the input terminal voltage exceeds $2.5 V$. Note $V\_{BE}=0.7 V$ **(6 marks)**

**QUESTION 5**

a) For a Common-base Equivalent Circuit with $I\_{E}=4 mA$, $α=0.98$ and an ac signal of $2 mV$ applied between the base and emitter terminals

 i) Determine the input impedance **(3 marks)**

 ii) Calculate the voltage gain if the load of $0.56 kΩ$ is connected to the output terminals. **(3 marks)**

 iii) Find the output impedance and current gain. **(3 marks)**

 b) A transistor operating in CB configuration has $I\_{C}=2.98 mA$, $I\_{E}=3 mA$ and $I\_{CO}=0.01 mA$. What

 current will flow in the collector circuit of this transistor when connected in CE configuration with a

 base current of $30 μA$. **(6 marks)**