COURSE CODE: **PHY310**
COURSE TITLE: **ELECTRONICS II**
CREDIT UNIT: **2**
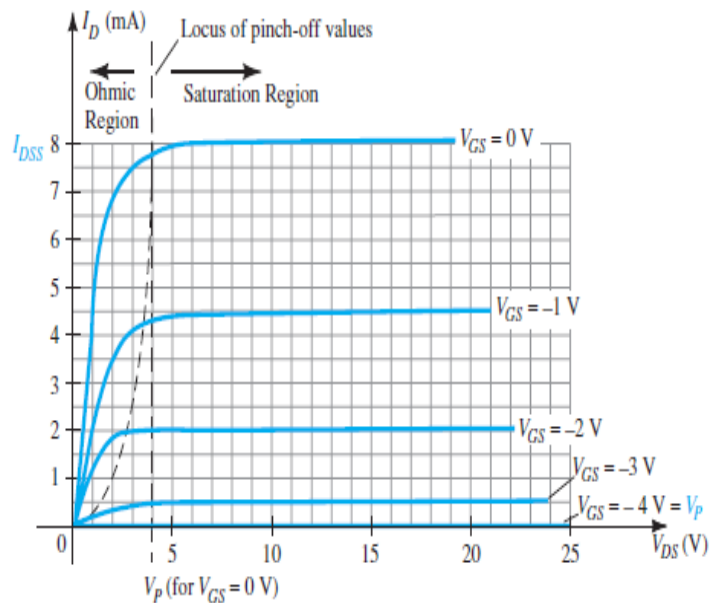**TIME ALLOWED:** **(2 HRS)**

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

QUESTION 1

(a). When does the maximum and minimum currents of JFET occur? **(4 marks)**

(b). Using the characteristics in the given figure, determine I_D for the following levels of V_{GS} (with $V_{DS} > V_P$): **(6 marks)**

(i). $V_{GS} = 0$ V.
(ii). $V_{GS} = 1.0$ V.
(iii). $V_{GS} = 1.5$ V.
(iv). $V_{GS} = 1.8$ V.
(v). $V_{GS} = 4.0$ V.
(vi). $V_{GS} = 6.0$ V.

(c). In what mode of operation is an enhancement MOSFET likely to be cut off? **(2 marks)**

(d). Which class amplifier would be he best for an audio sound system, and how would it be configured for minimal distortion of the input signal? **(4 marks)**

(e). List the three common terminal classifications of Bipolar Junction transistors **(3 marks)**

(f). What is skin effect? **(2 marks)**

(g). Why is alternating current from the public main supply very impure? **(2 marks)**

(h). What are filters basically used for in an electronic circuit?   **(2 marks)**

QUESTION 2

(a). Describe what is meant by a depletion-type MOSFET. **(3 marks)**

(b). Define Gain of an amplifier   **(2 marks)**

(c). For a class B amplifier providing a 20-V peak signal to a 16 Ω load (speaker) and a power supply of $V_{CC} = 30$ V, determine: (i) the input power **(4 marks)**

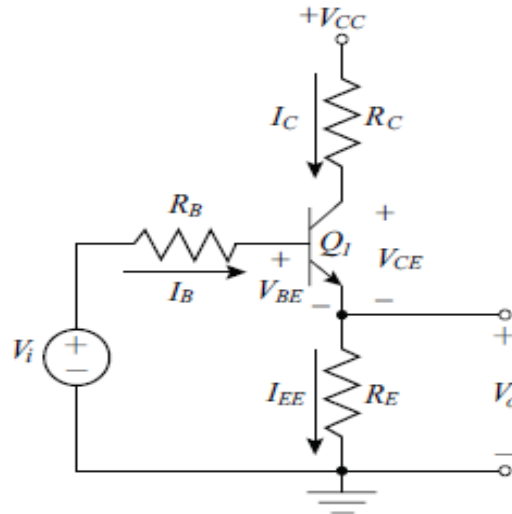(ii) output power **(3 marks)** (iii) circuit efficiency. **(3 marks)**

QUESTION 3

(a). In terms of output stage conduction, differentiate between the amplifier classes. **(8 marks)**

(b). The common-collector power amplifier shown in the figure has the following circuit element and transistor parameter values:

$V_{CC} = 15$ V; $R_C = 100$ Ω; $R_E = 100$ Ω; $R_B = 10$ k Ω; $\beta_F = 160$.

Determine the maximum efficiency of the power amplifier assuming no additional losses due to thermal effects. **(7 marks)**

QUESTION 4

(a). List the five basic passive filters types   **(5 marks)**

(b). For a class B amplifier providing a 22 V peak signal to an 8 Ω load and a power supply of $V_{CC} = 25$ V, determine: (i) Input power **(4 marks)** (ii) Output power **(4 marks)**

(iii) Circuit efficiency. **(3 marks)**

QUESTION 5

(a). Mention three merits and three demerits of switch-mode power supplies.   **(6 marks)**

(b). How do we reduce transmission losses (I^2R loss) in power transmission?   **(2 marks)**

(c). Briefly describe how a transistor is used to provide amplification.   **(2 marks)**

(d). How is a simple passive filter created?   **(2 marks)**

(e). Calculate the cut-off frequency of an RC low pass filter of R = 8.20 kΩ and C = 0.0033 µF   **(3 marks)**