UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BMT 2013
COURSE	: ELECTRONICS SYSTEM
SEMESTER/SESSION	: 1-2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains 4 questions. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 7 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

Figure 1 shows the circuit of an amplifier with common emitter configuration and β =110.

i. Determine the value of r_e. (5 marks)

ii. Draw the ac equivalent circuit for the network. (3 marks)

iii. Solve the voltage gain, A_v. (4 marks)

iv. Examine the High cutoff frequency, F_H. (10 marks)

Given:

$$C_{wi} = 5pF,\ C_{wo} = 7pF$$

$$C_{bc} = 3pF,\ C_{be} = 39pF,\ C_{ce} = 2pF$$

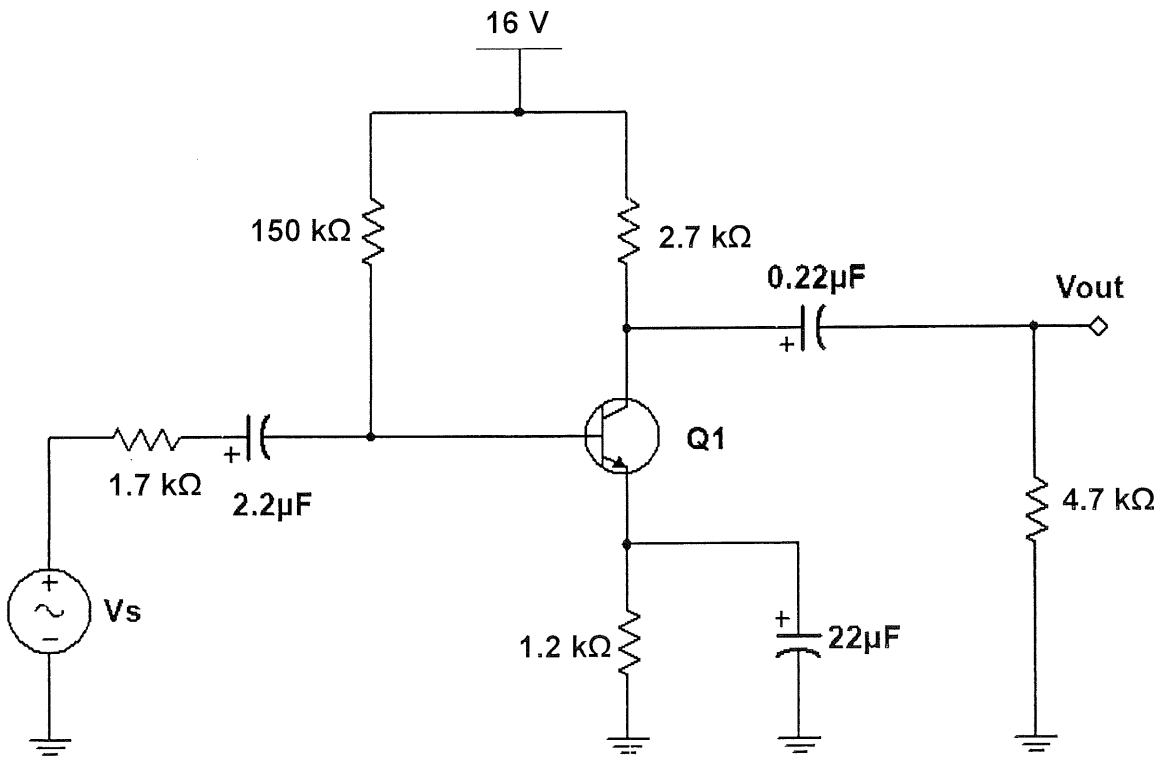

Figure 1

QUESTION 2

a) List **two (2)** types of **FET** Amplifier. (2 marks)

b) Sketch the transfer characteristics graph for the **JFET** transistor by using the drain-source leakage current, I_{DSS} **= 10mA** and pinch off voltage, V_P **= -6V.**

(5 marks)

c) From the network system in Figure 2, answer the following items:

i. Calculate g_{mo} and g_m, given V_{GSQ} **= -4V**. (4 marks)

ii. Draw the AC equivalent circuit for the network. (3 marks)

iii. Express the input impedance, Z_i and output impedance, Z_o. (4 marks)

iv. Solve the voltage gain, $A_V = V_{out}/V_{in}$. (4 marks)

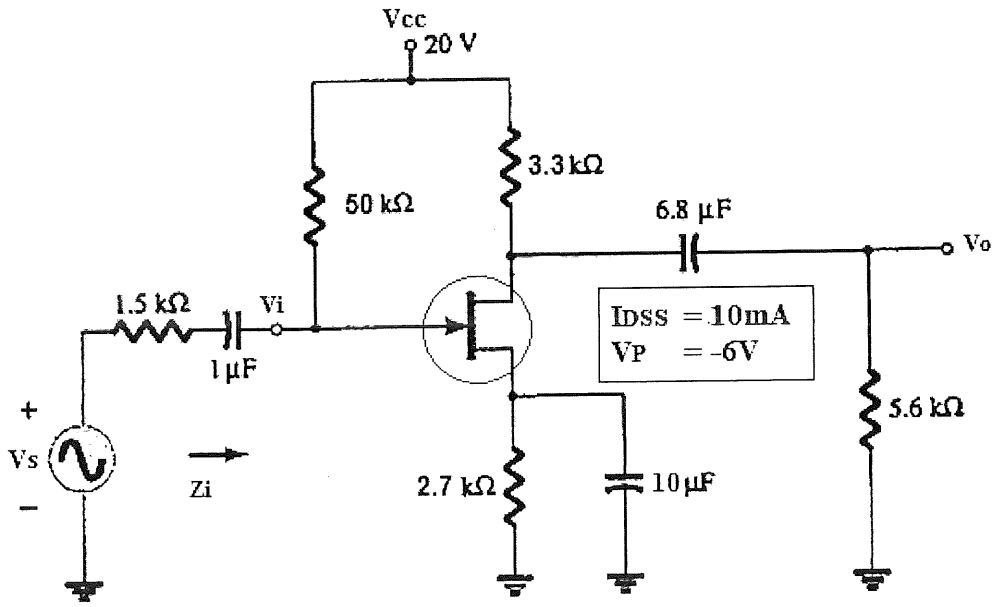

Figure 2

QUESTION 3

a) Answer the following questions:

i. Sketch a circuit of a basic non-inverting op-amp. (2 marks)

ii. Derive the closed-loop gain of the non-inverting op-amp. (2 marks)

b) Build a two-stage amplifier with gains of +34 and -11. Use a 330kΩ feedback resistor for all two circuits. (8 marks)

c) Examine the output voltage, V_o for the network in Figure 3 if V_{i1}= **-20mV** and V_{i2}= **25mV.** (10 marks)

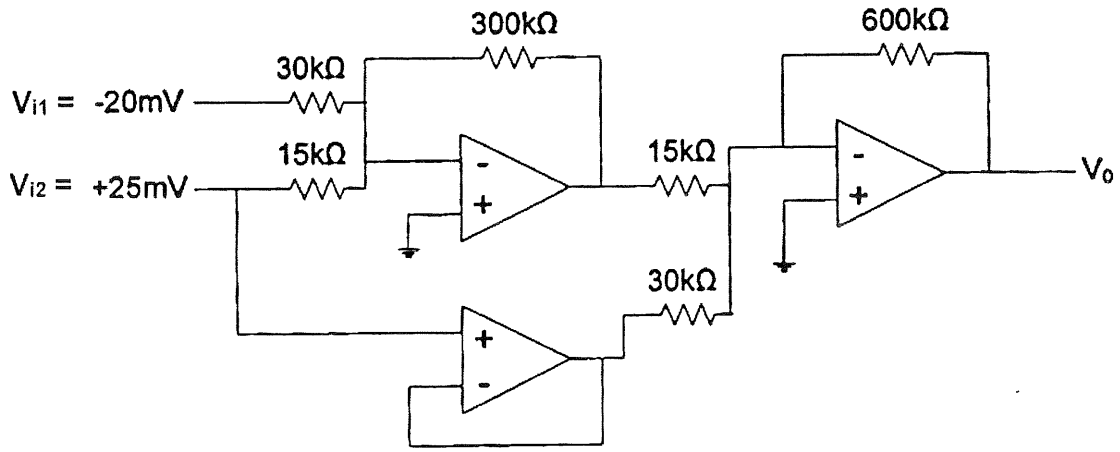

Figure 3

QUESTION 4

a) Answer the following questions:

i. Define the meaning of oscillator circuit. (2 marks)

ii. Name the **two (2)** types of oscillators. (2 marks)

iii. Briefly explain the purposes of the feedback circuit in oscillator. (2 marks)

b) Sketch a Wien-Bridge oscillator circuit. Hence, demonstrate the resistor values in the circuit such that the oscillation frequency is 2.5 kHz. Assume that the capacitor value is 0.15 uF and the resistor between the inverting terminal of op-amp and ground has a value of 7 kΩ. (8 marks)

c) Refer to circuit shown in Figure 4:

i. Name the oscillator. (2 marks)

ii. Design the circuit to oscillate at f_o = 25 kHz if R_1 = R2 = R3 =15 kΩ. (6 marks)

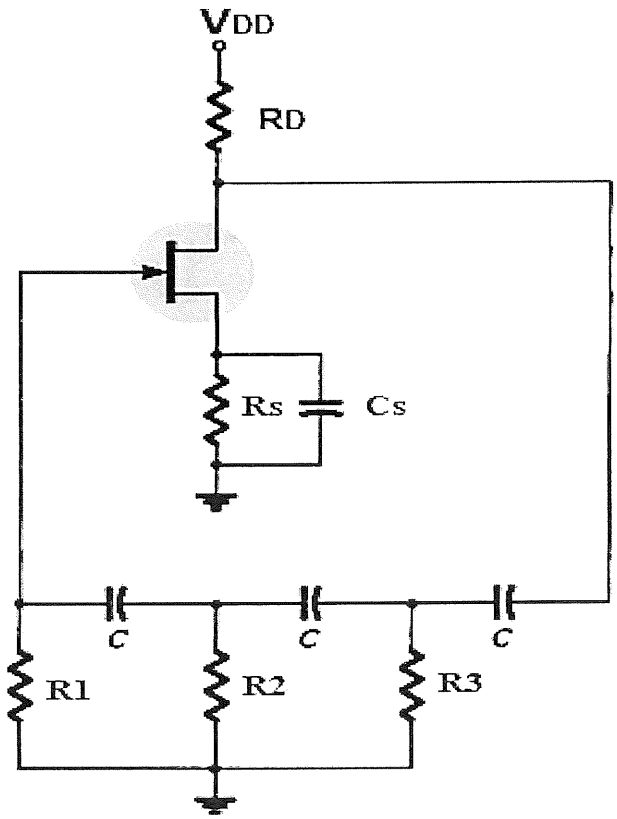

Figure 4

d) Answer the following questions:

i. Describe the Digital/Analog conversion. (2 marks)

ii. Draw the picture to support your answer in (i). (2 marks)

iii. List **two (2)** types of Digital/Analog conversion implementation circuit. (2 marks)

iv. Explain **two (2)** methods to improve the accuracy of analog to digital conversion. (4 marks)

v. List **two (2)** types of A/D converter. (2 marks)

----------End of question----------

Formula Electronics System

i. $g_{mo} = \frac{2I_{DSS}}{|V_p|}$

ii. $g_m = g_{mo}\left(1 - \frac{V_{GSQ}}{V_p}\right)$

iii. $A_{VS} = \frac{V_o}{V_s} = \frac{V_o}{V_i}.\frac{V_i}{V_s}$

iv. $$\mathbf{f_{Hi} = \frac{1}{2\pi R_{Thi} C_i}} \quad \text{where} \quad \mathbf{R_{Thi} = R_s \| R_1 \| R_2 \| R_i}$$

v. $$\mathbf{C_i = C_{Wi} + C_{be} + C_{Mi}}$$
$$\mathbf{= C_{Wi} + C_{be} + (1 - A_v)C_{bc}}$$

vi. $$\mathbf{f_{Ho} = \frac{1}{2\pi R_{Tho} C_o}} \quad \text{where} \quad \mathbf{R_{Tho} = R_C \| R_L \| r_o}$$

vii. $\mathbf{C_o = C_{Wo} + C_{ce} + C_{Mo}}$

viii. $C_{MO} = (1 - 1/A_V)\, C_{bc}$