MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY ORDINARY EXAMINATION

2023/2024 ACADEMIC YEAR

SECOND YEAR **SECOND** SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN ELECTRICAL AND ELECTRONICS ENGINEERING

EET201: ANALOGUE ELECTRONICS

DURATION: 2 HOURS

INSTRUCTIONS TO CANDIDATES:

1. Answer Question one and any other two questions.
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a) A certain P-N junction diode has a leakage current of 1014 A at room temperature of 27^{o}c and 10^{-9} A at 125^{o}c. The diode is forward blased with a constant – current source of 1mA at room temperature. If current is assumed to remain constant, calculate the junction barrer voltage at room temperature and at 125^{o}c (5marks)

b) For the circuit in Fig. 1(b) find;

i. I_B

ii. I_e

iii. I_E

iv. Vcc, neglect V_{BE} (5marks)

c) Using well-labelled diagram, explain the theory of operation of a depletion mode of N. channel MOSFET (5marks)

d) An ampli____ having a gain of 500 without feedback has an overall negative feedback applied which reduces the gain to 100. Calculate the fraction of output voltage feedback. If due to ageing of components, the gain without feedback falls by 20%, calculate the percentage fall in gain without feedback (5marks)

e) Calculate the oscillator frequency for a FETHa _____ oseillator (refer to fig 1(e) for the following circuit values; C=250pF; Li = 1.5mH, L_2=1.5mH, and m=0.5mH (5marks)

f) Explain theory of operation of a complementary sy_____ push-pull, class B Amplifier providing a well-labelled circuit diagram (5marks)

SECTION TWO: ANSWER ANY TWO QUESTIONS

QUESTION TWO (20 MARKS)

a) A half-wave vect____ using silicon diode has a secondary emt of 14.14v(rms) with a resistance of 0.2Ω. The diode has a forward resistance of 0.05Ω and a _____voltage of 0.7v. If load resistance is 10Ω, determine

i. Dc load current

ii. Dc load voltage

iii. Voltage regulation

iv. Efficiency (8marks)

b) Using well- labelled diagrams and waveforms, explain how a 3-phase full wave rectitior works. (6marks)

c) Find the exact expression of Emittor current in tons of the parameters indicated in the diagram, for the two-supply _____bias circuit of fig 2(c) (6marks)

QUESTION THREE (20 MARKS)

a) For a N-channel JFET, I_{Dss} = $.7mA, v_P = 3v, VGs = -1V find the value of;

i) I_D

ii) G_{mo}

iii) G_m (6marks)

b) For the copitts oscillator circuit shown in Fig.3(b) find the values of;

i. Feedback fraction

ii. Minimum gain to sustain esc_____

iii. Emitter resister R_E (6marks)

c) For the two –stage RC-coupled low-level audio _____shown in fig.3(c) compute the following

i. Vi

ii. A_{v1}

iii. A_{v2}

iv. A_v in d_B neglect V_{BE} and fake V_e=25mv/I_E

QUESTION FOUR (20 MARKS)

a) The signal input to a small signal amplition consists of 50uw of signal power and 0.5uw of noise power. The amplifier generates an internal noise power of 50uw and has a gain of 20dB. For this _____ compute;

i. Input S/N

ii. Output S/N

iii. Nolse factor

iv. Noise figure (7marks)

b) For the Rc-coupled circuit of fig. 4(b), calculate the lower cut-off frequency

i. At C_1

ii. At C_2

iii. For the amplitier (6marks)

c) Using a well labelled diagram, Explain how analog electronics are applied in FM Transmittor system. (7marks)