UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER III
SESSION 2014/2015

COURSE NAME	:	ELECTRONICS
COURSE CODE	:	DAR 21203
PROGRAMME	:	2 DAR
EXAMINATION DATE	:	AUGUST 2015
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **TWELVE (12)** PAGES

Q1 (a) Briefly describe the following:

(i) Valence electrons

(2 marks)

(ii) Covalent bonding

(2 marks)

(iii) Extrinsic semiconductor

(2 marks)

(b) Draw and completely label the output waveform, V_O for the circuit shown in **Figure Q1(b)**. Assume all the diodes are silicon. Show all your steps in obtaining the waveforms.

(6 marks)

(c) The following **Figure Q1(c)** shows the Zener diode circuit. Given, P_{ZM} (maximum power) = 40 mW. Assume the Zener diode is ideal.

(i) Calculate the output voltage, V_o

(2 marks)

(ii) Identify the voltage drop across load, V_{RL}

(2 marks)

(iii) Indicate the zener current, I_z

(2 marks)

(iv) Solve the power dissipated by the zener diode, P_z

(2 marks)

Q2 (a) Draw the P-N junction analogy and the symbol of bipolar junction transistor.

(4 marks)

(b) Based on the circuit in **Figure Q2(b)**,

(i) Determine the collector current, I_C

(2 marks)

(ii) Compute the value of V_{CC}

(2 marks)

(iii) Calculate the value of gain, β

(2 marks)

(iv) Evaluate the value of resistor, R_B for the circuit given.

(2 marks)

(c) Based on the voltage feedback biasing circuit given in **Figure Q2(c)**.

(i) Identify the value of quiescent level of collector current, I_{CQ}

(4 marks)

(ii) Determine the value of quiescent level of collector-emitter voltage, V_{CEQ}

(2 marks)

(iii) Calculate the collector current, V_C

(2 marks)

Q3 (a) With the aid of an appropriate circuit, illustrate how the transistor can be used as a switch.

(8 marks)

(b) By analysing the circuit given in **Figure Q3(b)**, based on the voltage-divider configuration,

(i) Estimate the value of Thevenin equivalent resistor, R_{TH}

(2 marks)

(ii) Compute the Thevenin equivalent voltage, V_{TH}

(2 marks)

(iii) Determine the collector current, I_C

(4 marks)

(iv) Draw the Thevenin equivalent circuit with labelling

(2 marks)

(v) Identify the collector-emitter voltage, V_{CE}

(2 marks)

Q4 The common-emitter amplifier circuit configuration is shown in **Figure Q4**. By referring to the figure;

(a) Draw the AC equivalent circuit by using the PIE (π) model with complete labelling.

(3 marks)

(b) By using the same model given in **Figure Q4**;

(i) Calculate the AC emitter resistance, r_e

(5 marks)

(ii) Determine the input impedance of the base, Z_{in} (base)

(2 marks)

(iii) Find the input impedance of the stage, Z_{in} (stage)

(2 marks)

(iv) Identify the AC collector resistance, r_c

(2 marks)

(v) Compute the input voltage, V_{in}

(2 marks)

(vi) Solve the voltage gain, A_v

(2 marks)

(vii) Estimate the output voltage across resistor R_L, V_{out}

(2 marks)

Q5 (a) List **two (2)** characteristics for each of the following classes of amplifiers.

(i) Class A

(2 marks)

(ii) Class B

(2 marks)

(iii) Class C

(2 marks)

(b) For a power amplifier configuration of **Figure Q5(b)** with I_{CQ} = 13.24 mA, solve the following requirements;

(i) Calculate the transistor power dissipation, P_{DQ}

(4 marks)

(ii) Determine the voltage gain, A_v

(3 marks)

(iii) Find the Peak-peak output voltage, V_{out}

(2 marks)

(iv) Evaluate the AC load power, P_{out}

(2 marks)

(v) Identify DC input power, Pdc

(2 marks)

(vi) Compute the Stage efficiency, η

(1 mark)

Q6 Given the JFET CS amplifier self-bias circuit configuration shown in ***Figure Q6***.

(a) Draw the AC equivalent circuit for the given circuit configuration with complete labelling

(4 marks)

(b) By applying I_{DSS} = 9mA and $V_{GS(off)}$ = - 4.5V,

(i) Calculate the input impedance, Z_i

(3marks)

(ii) Determine the output impedance, Z_o

(3marks)

(iii) Compute the output voltage, V_o

(5marks)

(iv) Identify the voltage gain, A_V

(5marks)

Q7 (a) For the Colpitts CB oscillator circuit as shown in **Figure Q7(a)**,

(i) Calculate the frequency of the oscillator

(4marks)

(ii) Determine the value of feedback fraction, Beta

(4marks)

(iii) Estimate the minimum value of voltage gain, Av, for the oscillator to start

(2marks)

(b) By referring to **Figure Q7(b)**;

(i) Sketch the circuit of a 555 timer connected as an astable multivibrator for operation at 350 kHz.

(3marks)

(ii) Determine the value of capacitor C needed using $R_A = R_B = 7.5\ k\Omega$

(4marks)

(iii) Sketch the output waveform resulting from that astable circuit.

(3marks)

- END OF QUESTIONS -

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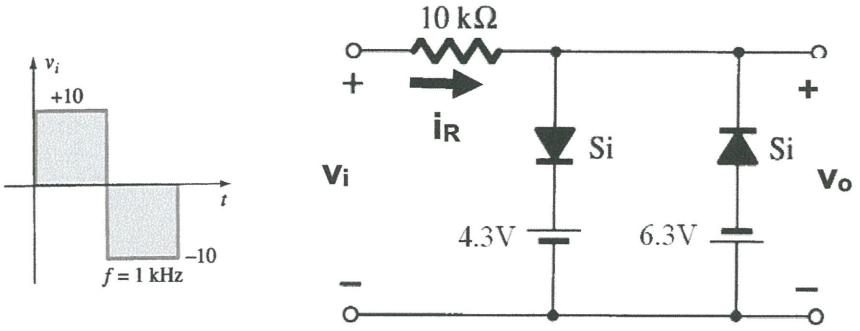

FIGURE Q1(b)

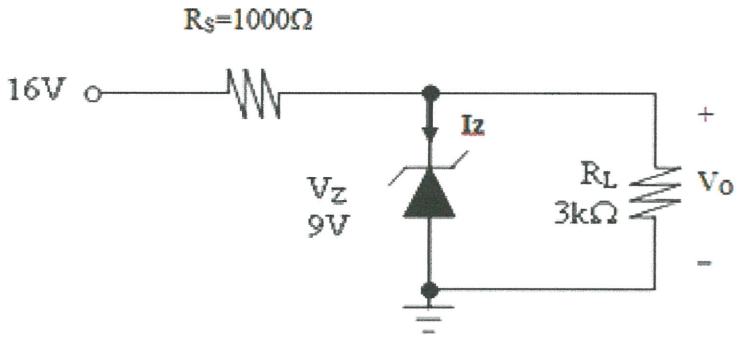

FIGURE Q1(c)

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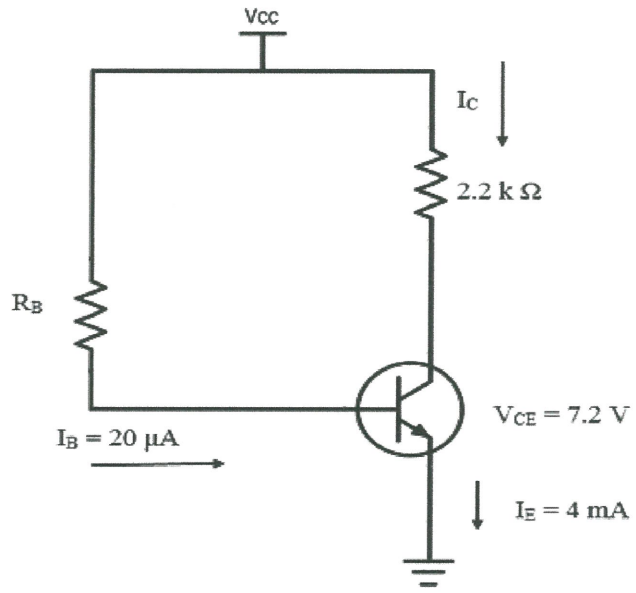

FIGURE Q2(b)

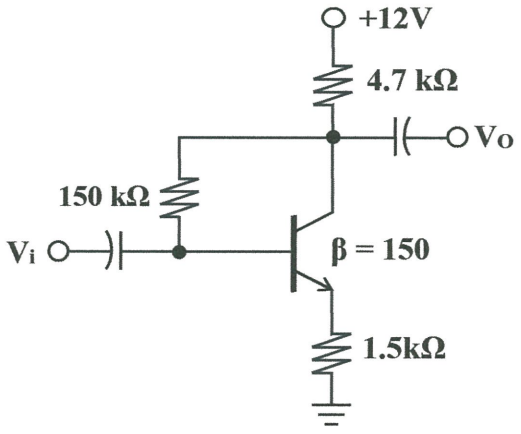

FIGURE Q2(c)

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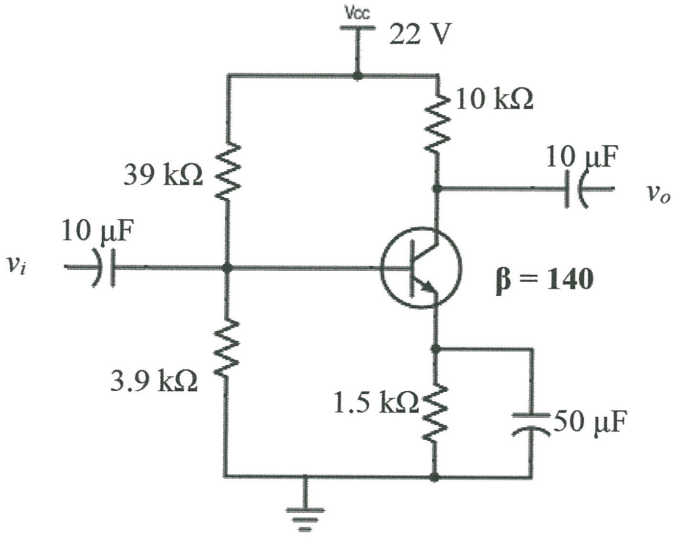

FIGURE Q3(b)

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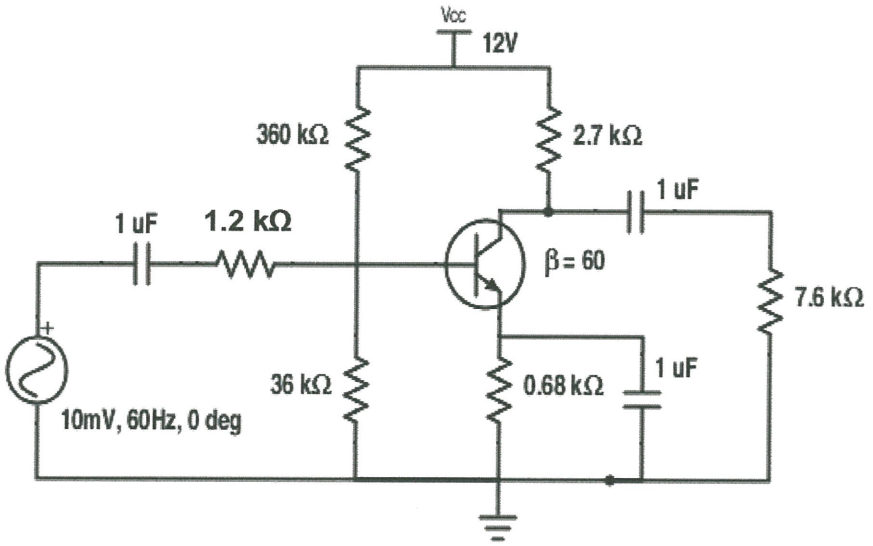

FIGURE Q4

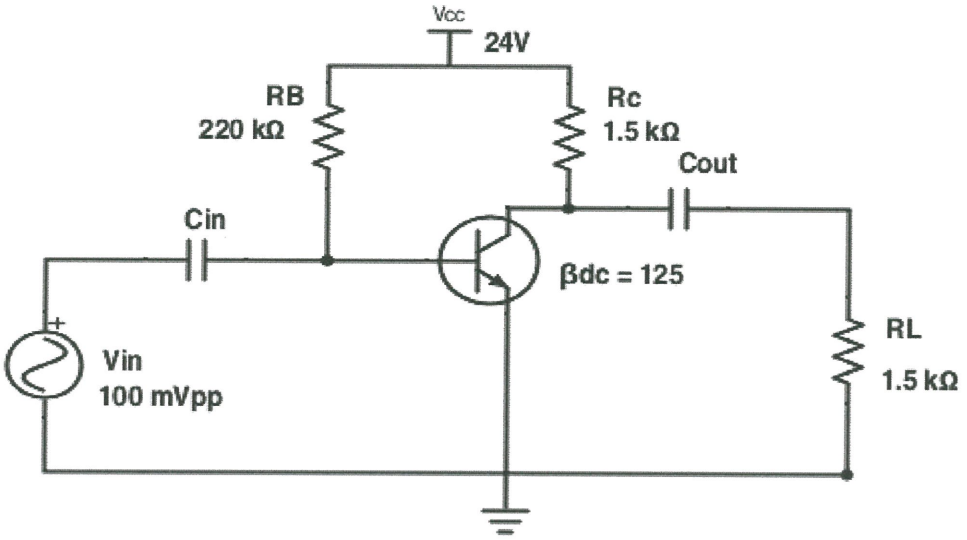

FIGURE Q5(b)

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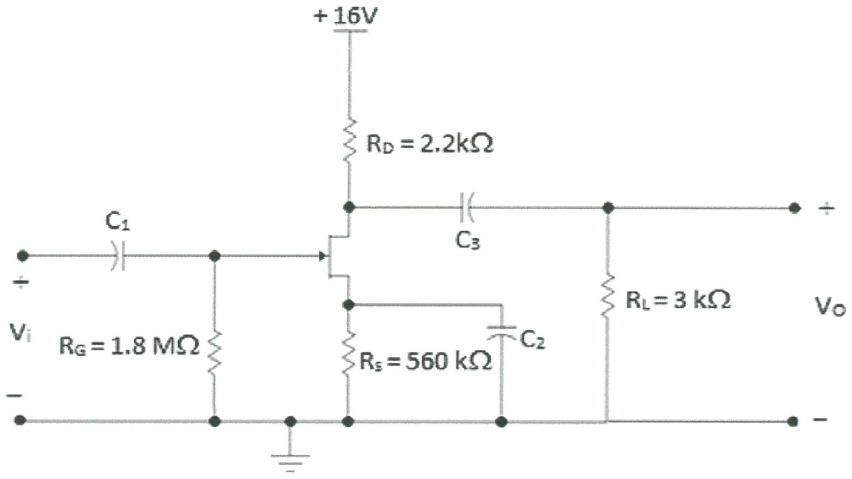

FIGURE Q6

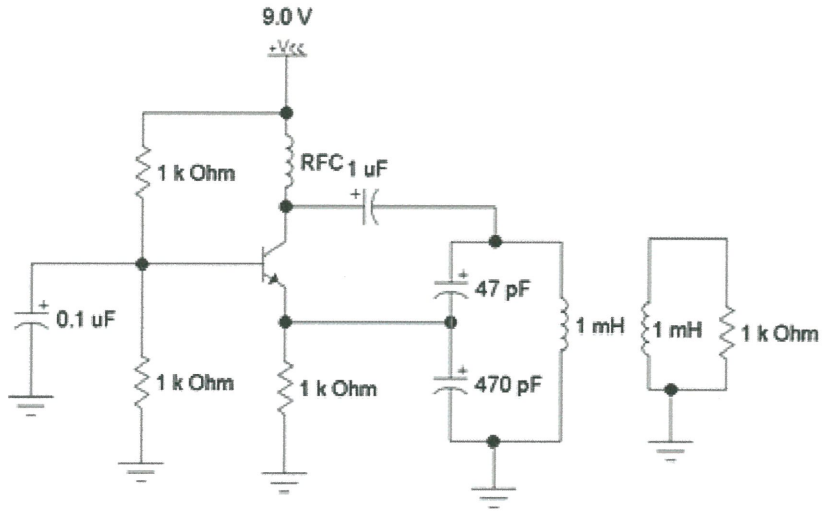

FIGURE Q7(a)

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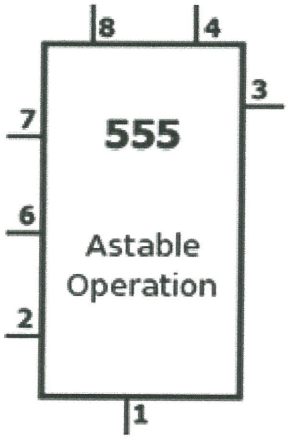

FIGURE Q7(b)