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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER III
SESSION 2013/2014**

COURSE NAME : ELECTRONICS
COURSE CODE : DAR 21203
PROGRAMME : 2 DAR
EXAMINATION DATE : AUGUST 2014
DURATION : 3 HOURS
INSTRUCTION : ANSWER **FIVE (5)** QUESTIONS
ONLY

THIS QUESTION PAPER CONSISTS OF **THIRTEEN (13)** PAGES

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- Q1** (a) **Figure Q1(a)** shows the voltage waveforms across each half of the secondary winding and across R_L when a 100V peak sine wave is applied to the primary winding.
- (i) Identify the type of this rectifier circuit. (1 mark)
 - (ii) Define the type of stepped transformer it is used. (1 mark)
 - (iii) Find the transformer turns ratio, n . (1 mark)
 - (iv) Find the total peak secondary voltage, $V_{p(sec)}$. (1 mark)
 - (v) Find the peak secondary voltage, $V_{p(sec)}$ across each half of the secondary winding. (1 mark)
- (b) For the circuit in **Figure Q1(b)**;
- (i) Redraw the network diagram for positive half-cycle & negative half-cycle of v_i . (4 marks)
 - (ii) Calculate the average value of output voltage, V_{AVG} . (3 marks)
- (c) Considering the bridge rectifier in **Figure Q1(c)**. Assuming the transformer is specified to have a 12V rms secondary voltage for the standard 120V across the primary.
- (i) Calculate the peak secondary voltage, V_p . (2 marks)
 - (ii) Calculate the peak output secondary voltage, $V_{p(out)}$. (2 marks)
 - (iii) Calculate the average value of output voltage, V_{AVG} . (2 marks)
 - (iv) What PIV rating is required for the diodes? (2 marks)

- Q2** (a) For the circuit that has a configuration in **Figure Q2(a)**, determine the following values. Assume $\beta_{DC} = 200$.
- (i) Base current, I_B . (2 marks)
 - (ii) Collector current, I_C . (1 mark)
 - (iii) Collector-Emitter voltage, V_{CE} . (2 marks)
 - (iv) Saturation current, $I_{C(SAT)}$. (2 marks)
 - (v) Draw a DC load line and plot the Q-point. (2 marks)
 - (vi) Determine the maximum peak variation of the collector current, $I_{C(peak)}$. (2 marks)
 - (vii) Determine the maximum peak variation of the base current, $I_{B(peak)}$. (1 mark)
- (b) For the collector feedback bias circuit in **Figure Q2(b)**, find the following values.
- (i) Collector current, I_C . (2 marks)
 - (ii) Collector-Emitter voltage, V_{CE} . (2 marks)
 - (iii) Collector current, I_C if β_{DC} changed to 200. (2 marks)
 - (iv) Collector-Emitter voltage, V_{CE} if β_{DC} changed to 200. (2 marks)

- Q3** (a) Select a minimum value for the emitter bypass capacitor, C_2 , in **Figure Q3(a)** if the amplifier must operate over a frequency range from 200 Hz to 10 kHz. (4 marks)
- (b) For the common-emitter amplifier in **Figure Q3(b)**, solve the items below.
- (i) Draw the ac equivalent circuit with complete labelling. (4 marks)
- (ii) Determine the ac emitter resistance, r_e' . (2 marks)
- (iii) Determine the input resistance at the base, $R_{in(base)}$. (2 marks)
- (iv) Find the attenuation from source to base. (4 marks)
- (v) Find the voltage gain from base to collector. (4 marks)
- Q4** (a) Explain the amplifier classification. (4 marks)
- (b) Solve the problems below.
- (i) 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 the input power, output power, and circuit efficiency. (4 marks)
- (ii) For a class B amplifier using a supply of $V_{CC} = 30$ V and driving a load of 16- Ω , determine the maximum input power, output power, and transistor dissipation. (3 marks)
- (iii) Calculate the efficiency of a class B amplifier for a supply voltage of $V_{CC} = 24$ V with peak output voltages of $V_L(p) = 22$ V and $V_L(p) = 6$ V. (2 marks)
- (iv) Calculate the input and output power for the circuit of **Figure Q4(b)**. The input signal results in a base current of 5 mA rms. (2 marks)

- (v) If the circuit of **Figure Q4(b)** is biased at its center voltage and center collector operating point, what is the input power for a maximum output power of 1.5 W?
(3 marks)
- (vi) Calculate the input power dissipated by the circuit of **Figure Q4(b)** if R_B is changed to 1.5 k Ω .
(2 marks)

Q5 Based on the FET circuit configuration shown in **Figure Q5(a)**;

- (a) Calculate the following data:
- (i) The Gate Voltage, V_G
(4 marks)
- (ii) The Drain Current, I_D
(2 marks)
- (iii) The Gate-to- Source potential difference, V_{GS}
(1 mark)
- (iv) The Drain Voltage, V_D
(1 mark)
- (v) The Drain-to- Source potential difference, V_{DS}
(2 marks)
- (b) State **two (2)** advantages of FET amplifier compared to BJT's
(2 marks)
- (c) Determine the following values for the given network shown in **Figure Q5(c)**.
- (i) V_G , the Gate voltage
(3 marks)
- (ii) V_{GS} , the Gate-to- Source potential difference
(3 marks)
- (iii) Estimate the value of the Q-points (I_{DQ} and V_{GSQ})
(2 marks)

- 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) Determine the following data if $I_{DSS} = 9\text{mA}$ and $V_p = -4.5\text{V}$, $V_{in} = 20\text{mV}$ and the value of Drain internal resistance (r_d) can be neglected.
- (i) The input impedance, Z_{in} (3 marks)
- (ii) The output impedance, Z_o (3 marks)
- (iii) The output voltage, V_o (5 marks)
- (iv) The Voltage gain, A_v (5 marks)
- Q7** (a) For the Colpitts CB oscillator circuit as shown in **Figure 7(a)**, calculate the following data;
- (i) Frequency of the oscillator. (4 marks)
- (ii) The value of feedback fraction, Beta. (4 marks)
- (iii) The minimum value of voltage gain, A_v , for the oscillator to start. (2 marks)
- (b) For the 555 Timer circuit shown in **Figure 7(b)**, determine the following requirements;
- (i) The frequency of the output signal (4 marks)
- (ii) The Duty cycle (4 marks)
- (iii) The output waveform (2 marks)

- END OF QUESTION -

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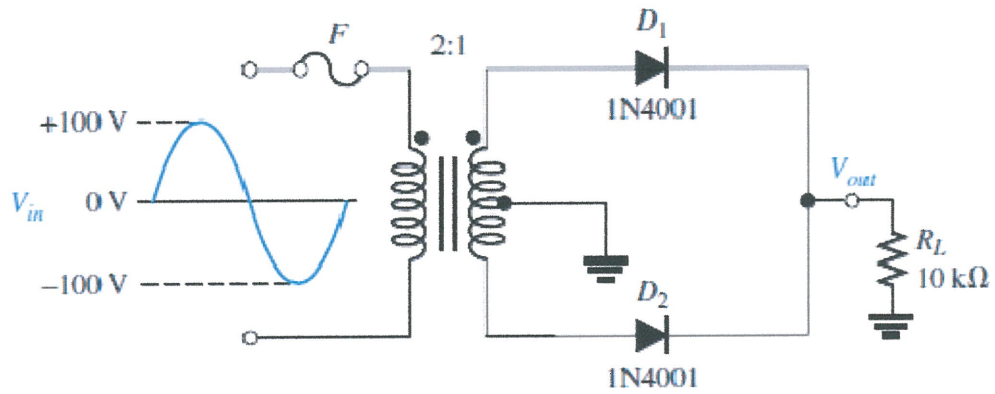


FIGURE Q1(a)

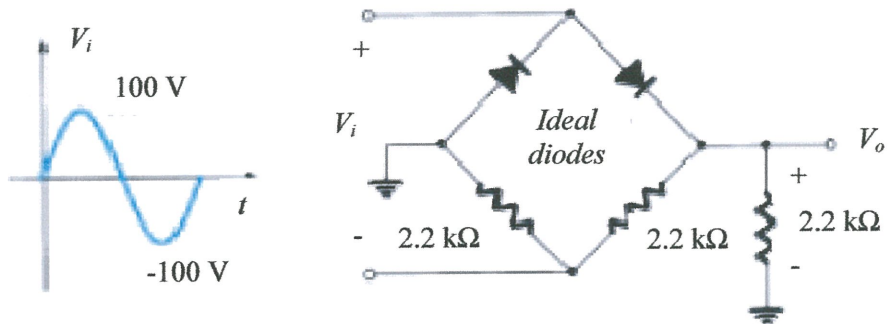


FIGURE Q1(b)

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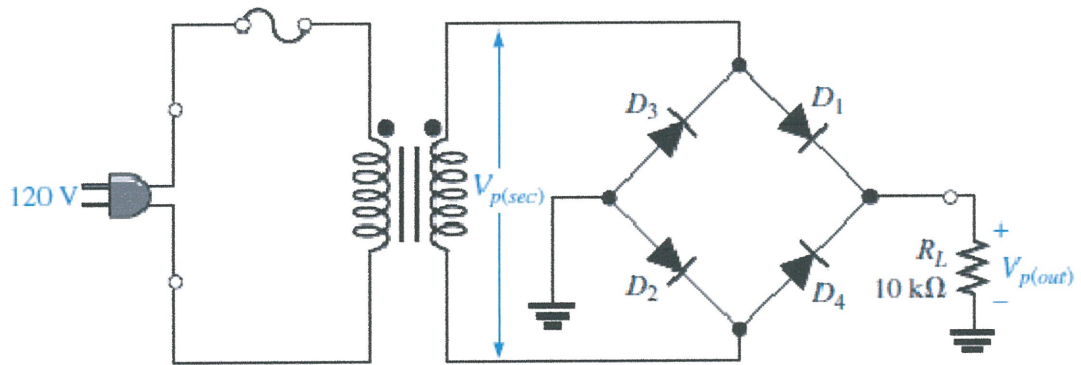


FIGURE Q1(c)

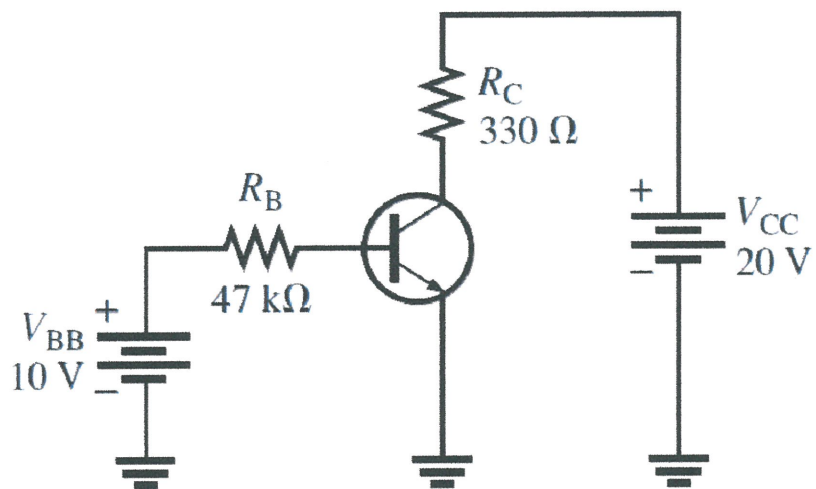


FIGURE Q2(a)

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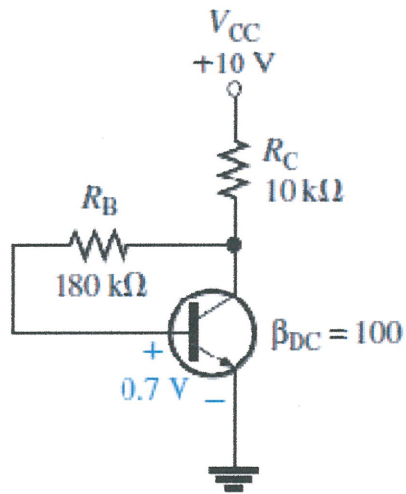


FIGURE Q2(b)

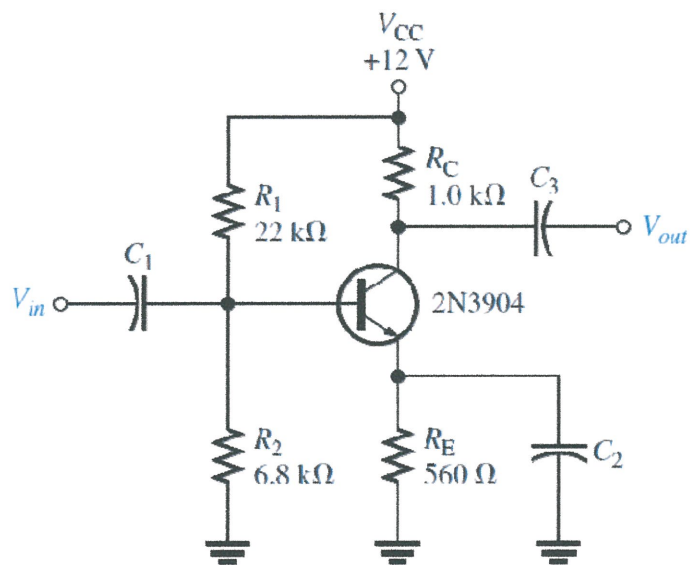


FIGURE Q3(a)

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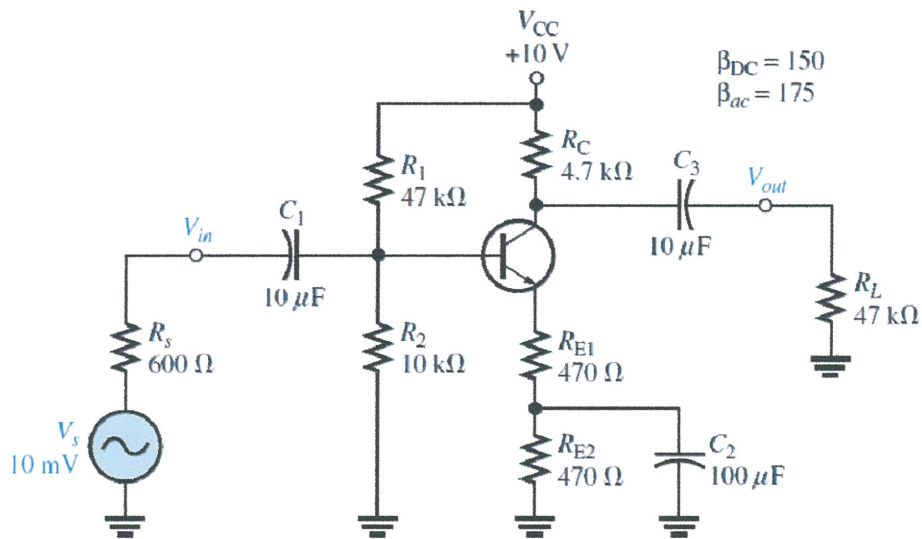


FIGURE Q3(b)

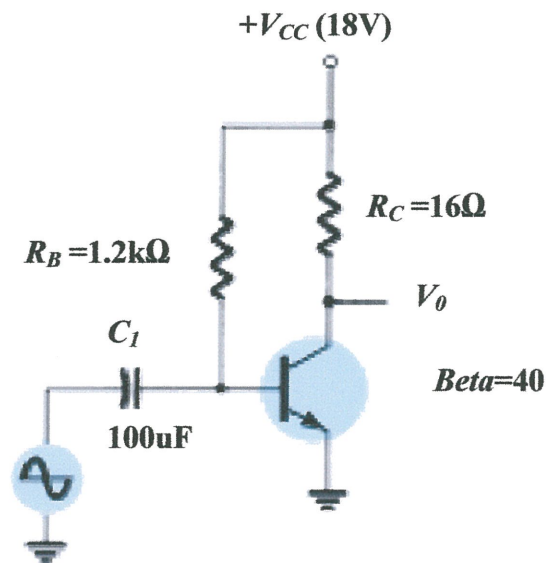


FIGURE Q4(b)

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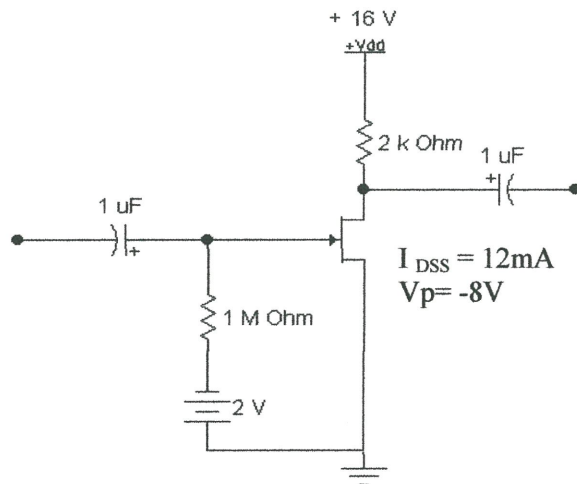


FIGURE Q5(a)

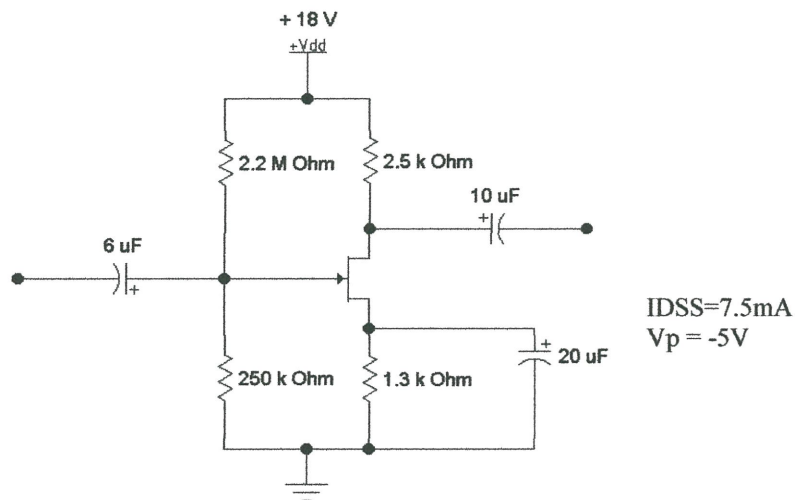


FIGURE Q5(c)

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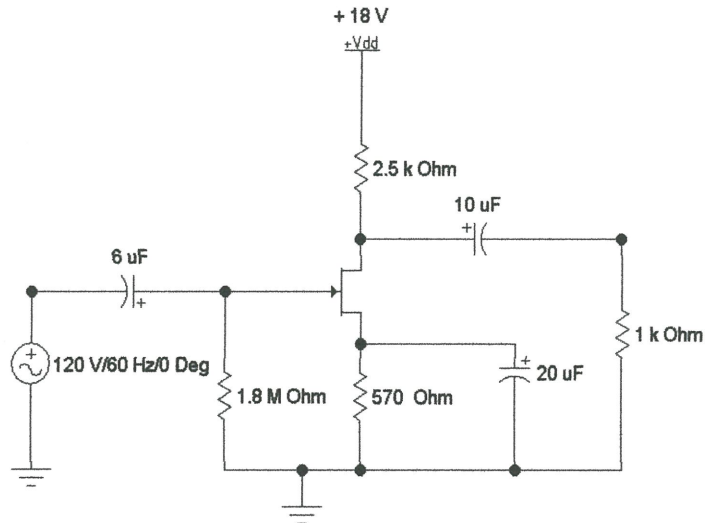


FIGURE Q6

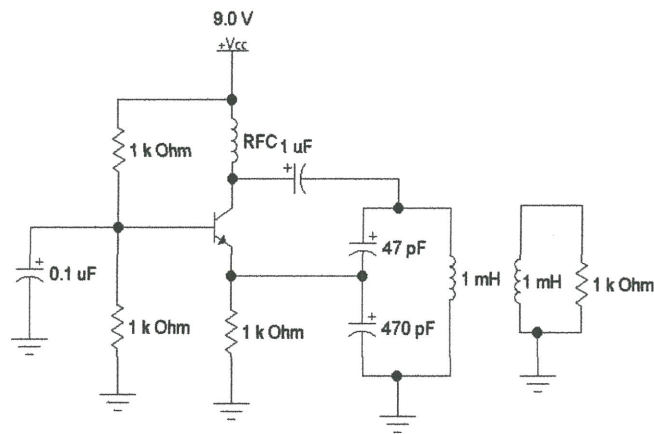


FIGURE Q7(a)

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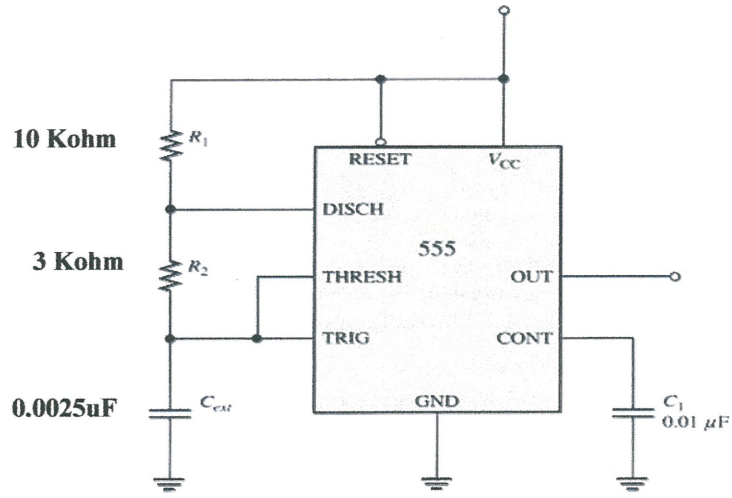


FIGURE Q7(b)