



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013**

COURSE NAME : ELECTRONICS
COURSE CODE : DEE 2133
PROGRAMME : 2 DEE/DET
EXAMINATION DATE : OCTOBER 2012
DURATION : 2½ HOURS
INSTRUCTION : ANSWER **FOUR (4)** QUESTIONS ONLY.

THIS QUESTION PAPER CONSISTS OF TEN (10) PAGES

- Q1**
- (a) Figure Q1(a) shows the characteristics of a diode. What type of material is used in this diode? Give a reason for your answer. (4 marks)
- (b) Use the characteristic shown in Figure Q1(a) to determine the resistance of the diode when
- (i) Forward voltage $V_F = 0.65\text{V}$ (3 marks)
- (ii) Forward current $I_F = 4\text{ mA}$ (3 marks)
- (c) Determine the output voltage V_o and the diode current I_D for the circuit of Figure Q1(c). (6 marks)
- (d) For the zener diode network of Figure Q1(d).
- (i) Is the zener diode operating in the breakdown region? (3 marks)
- (ii) Determine the load voltage V_L , series resistor voltage V_R , and diode zener current I_Z . (6 marks)
- Q2**
- (a) Consider the circuit in Figure Q2(a).
- (i) What type of circuit is this? (2 marks)
- (ii) What is the total peak secondary voltage? (2 marks)
- (iii) Find the peak voltage across each half of the secondary. (2 marks)
- (iv) Calculate the peak output voltage. (3 marks)
- (v) Determine the DC output voltage. (3 marks)
- (b) If one of the diodes in Figure Q2(a) were open, what would happen to the output voltage. (4 marks)
- (c) Determine the output voltage waveform V_o for the circuit in Figure Q2(b) using the second approximation. (9 marks)
- Q3** Referring to Figure Q3 :
- (a) Determine the DC values of base voltage V_B , emitter voltage V_E and collector voltage V_C . (10 marks)

- (b) Calculate the AC emitter resistance, r_e . (3 marks)
- (c) Draw the AC equivalent circuit. (3 marks)
- (d) What is the input impedance, Z_i . (3 marks)
- (e) Calculate the voltage gain, A_V . (3 marks)
- (f) What is the output voltage, v_{out} . (3 marks)

Q4 For the self-bias common-source amplifier of Figure Q4.

- (a) Solve for each of the following DC quantities:
 - (i) Gate voltage, V_G (3 marks)
 - (ii) Gate-source voltage, V_{GS} (2 marks)
 - (iii) Drain current, I_D (2 marks)
 - (iv) Drain voltage, V_D (3 marks)
- (b) Solve for each of the following AC quantities:
 - (i) Input impedance, Z_{in} (3 marks)
 - (ii) Load resistance, r_L (2 marks)
 - (iii) Transconductance when $V_{GS} = 0$, g_{m0} (3 marks)
 - (iv) Transconductance, g_m (2 marks)
 - (v) Voltage gain, A_V (3 marks)
 - (vi) Output voltage, v_{out} (2 marks)

Q5 (a) List two 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) In Figure Q5(b), solve for the following:

- (i) Transistor Power Dissipation (P_{DQ}) (6 marks)
- (ii) Voltage gain (A_V) (3 marks)
- (iii) Peak-peak output voltage (v_{out}) (2 marks)
- (iv) AC load power (P_{out}) (3 marks)
- (v) DC input power (P_{dc}) (3 marks)
- (vi) Stage Efficiency (η) (2 marks)

- Q6** (a) Explain the purpose of an oscillator and what are the conditions required for a circuit to oscillate. (9 marks)
- (b) Referring to Figure Q6(b), calculate :
- (i) Frequency of oscillation. (4 marks)
 - (ii) Value of feedback fraction (B). (3 marks)
 - (iii) Minimum value of voltage gain (A_V) for the oscillator to start. (3 marks)
- (c) The 555 timer of Figure Q6(c) has $R_1 = 20 \text{ k}\Omega$, $R_2 = 10 \text{ k}\Omega$, and $C = 0.047 \text{ }\mu\text{F}$.
- (i) Calculate frequency of the output signal. (3 marks)
 - (ii) Compute the duty cycle. (3 marks)

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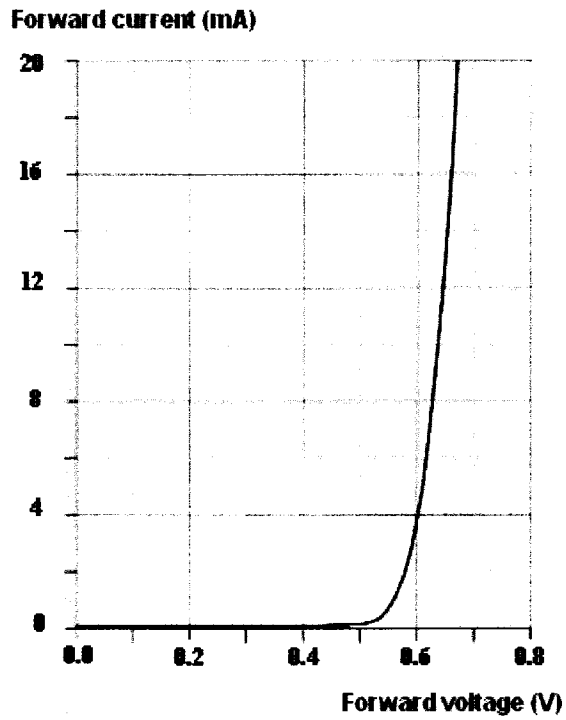


FIGURE Q1(a)

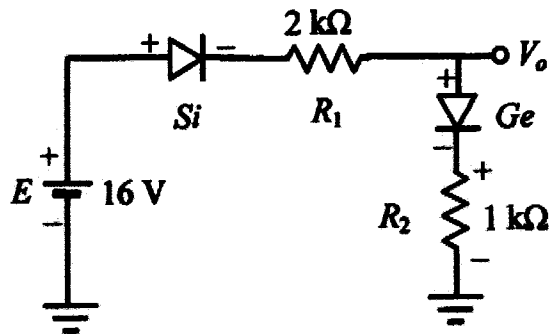


FIGURE Q1(c)

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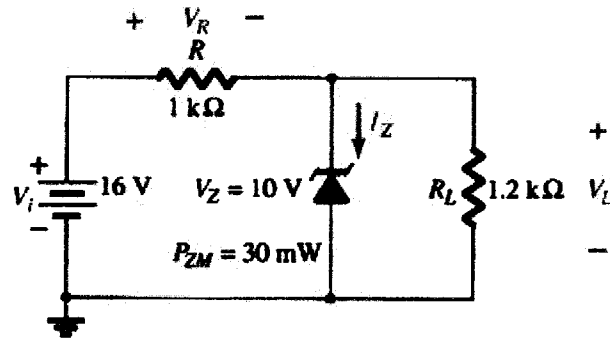


FIGURE Q1(d)

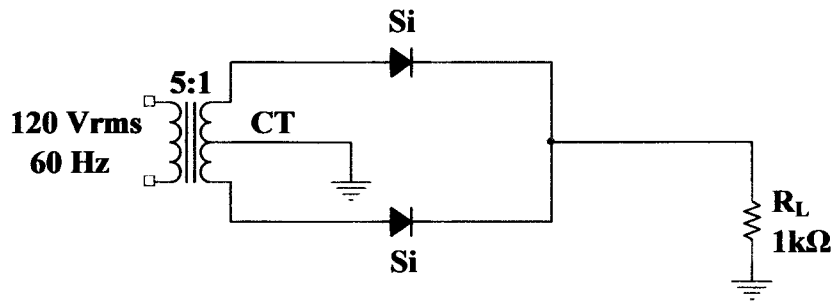


FIGURE Q2(a)

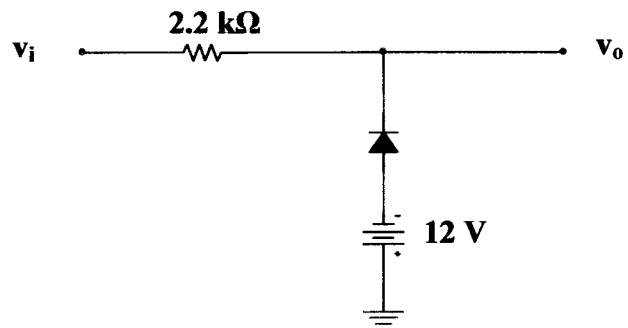
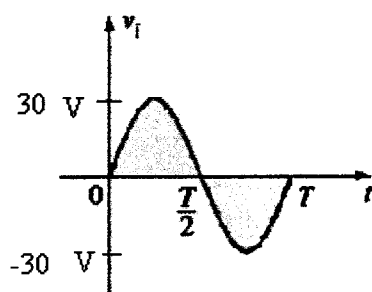
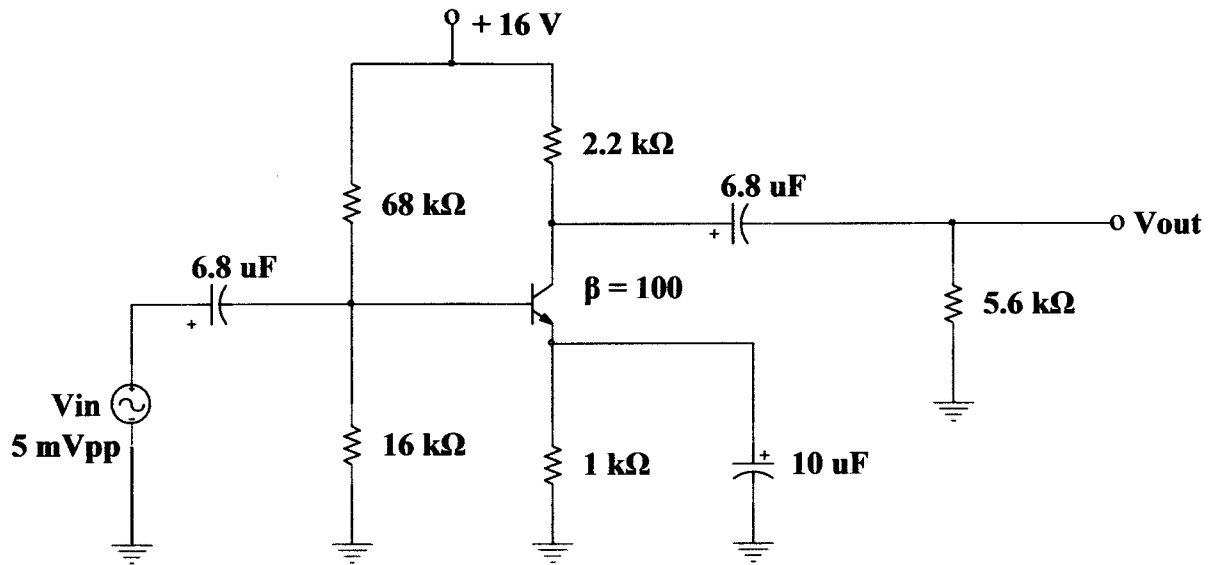


FIGURE Q2(b)

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**FIGURE Q3**

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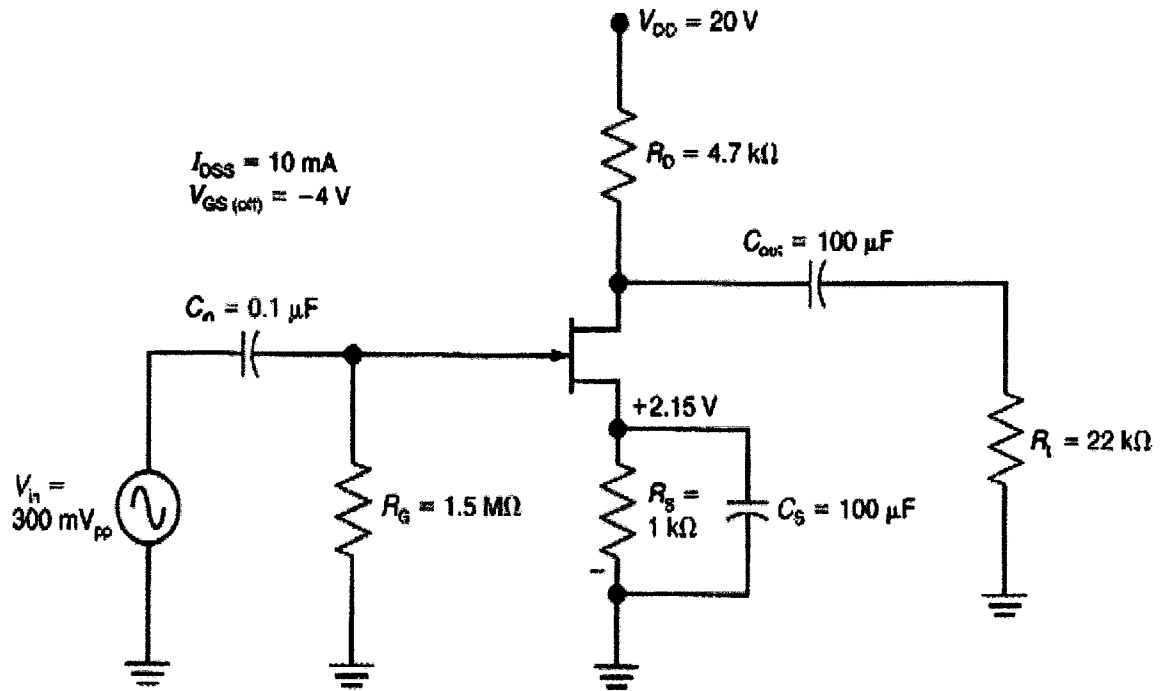


FIGURE Q4

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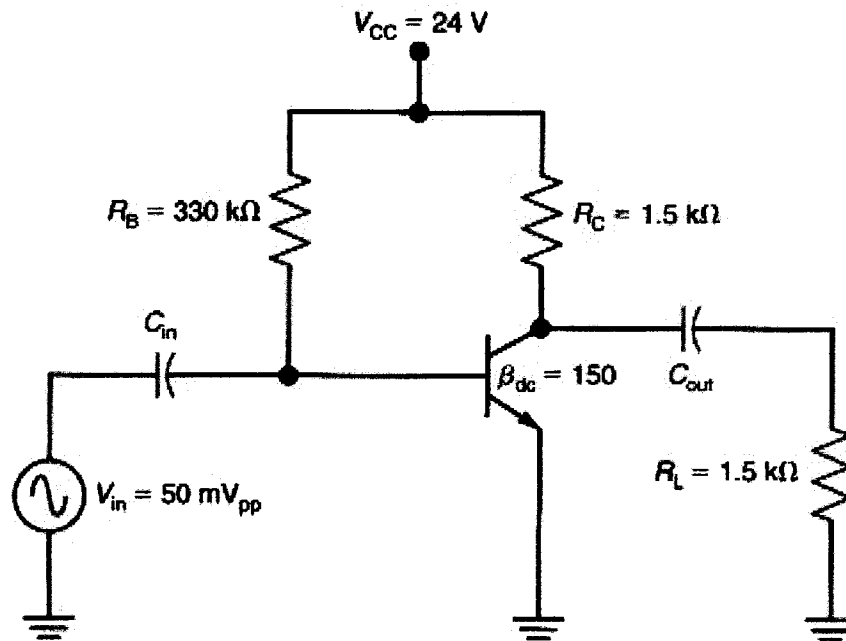


FIGURE Q5(b)

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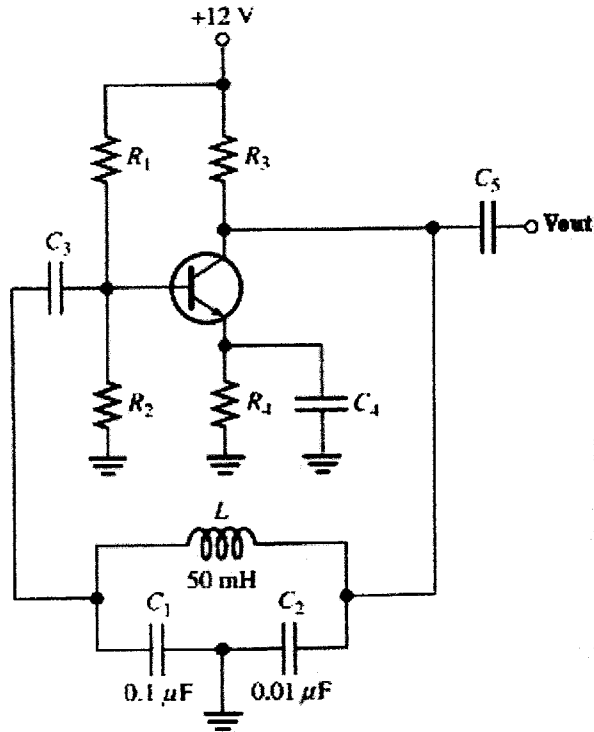


FIGURE Q6(b)

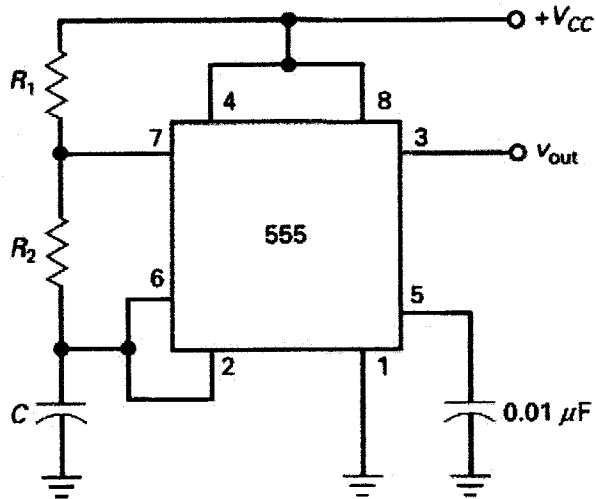


FIGURE Q6(c)