



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR SEMESTER I SESI 2009/2010

NAMA MATAPELAJARAN : ELEKTRONIK
KOD MATAPELAJARAN : DEE 2133
KURSUS : 2 DET/DEE
TARIKH PEPERIKSAAN : NOVEMBER 2009
JANGKA MASA : 3 JAM
ARAHAN : JAWAB LIMA (5) SOALAN SAHAJA

KERTAS SOALAN INI MENGANDUNGI 10 MUKA SURAT

- 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. (3 marks)
- (b) Use the characteristic shown in Figure Q1(a) to determine the resistance of the diode when
- (i) Forward voltage $V_F = 0.65\text{V}$ (2 marks)
- (ii) Forward current $I_F = 4\text{ mA}$ (2 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? (2 marks)
- (ii) Determine the load voltage V_L , series resistor voltage V_R , and diode zener current I_Z . (5 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. (2 marks)
- (v) Determine the DC output voltage. (2 marks)
- (b) If one of the diodes in Figure Q2(a) were open, what would happen to the output voltage. (3 marks)
- (c) Determine the output voltage waveform V_o for the circuit in Figure Q2(b) using the second approximation. (7 marks)
- Q3**
- (a) In what operating region does the collector of a transistor act like a current source? (2 marks)
- (b) In what region is a transistor operating if the collector current is zero? (2 marks)
- (c) Why is emitter bias more stable than base bias? (2 marks)

- (d) A transistor has the following currents: Emitter current $I_E = 3.2$ mA and base current $I_B = 20$ μ A. Solve for α_{dc} , β_{dc} and collector current I_C . (6 marks)
- (e) Draw a DC load line for the transistor circuit in Figure Q3(d) and indicate the values of $I_{C(sat)}$, $V_{CE(off)}$, I_{CQ} , and V_{CEQ} on the load line. (8 marks)

Q4 Referring to Figure Q4(b) :

- (a) Determine the DC values of base voltage V_B , emitter voltage V_E and collector voltage V_C . (7 marks)
- (b) Calculate the AC emitter resistance, r'_e . (2 marks)
- (c) Calculate the AC collector resistance, r_c . (2 marks)
- (d) Draw the ac equivalent circuit. (2 marks)
- (e) What is the input impedance of the stage, $Z_{in(stage)}$, if $\beta = 100$. (3 marks)
- (f) Calculate the voltage gain, A_v (2 marks)
- (g) What is the output voltage, v_{out} (2 marks)

Q5 For the self-bias common-source amplifier of Figure Q5,

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

Q6 (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 Q6(b), solve for the following:
- (i) Transistor Power Dissipation (P_{DQ}) (4 marks)
 - (ii) Voltage gain (A_V) (2 marks)
 - (iii) Peak-peak output voltage (v_{out}) (2 marks)
 - (iv) AC load power (P_{out}) (2 marks)
 - (v) DC input power (P_{dc}) (2 marks)
 - (vi) Stage Efficiency (η) (2 marks)
- Q7** (a) Explain the purpose of an oscillator and what are the conditions required for a circuit to oscillate. (6 marks)
- (b) Referring to Figure Q7(b), calculate :
- (i) Frequency of oscillation. (4 marks)
 - (ii) Value of feedback fraction (B). (2 marks)
 - (iii) Minimum value of voltage gain (A_V) for the oscillator to start. (2 marks)
- (c) The 555 timer of Figure Q7(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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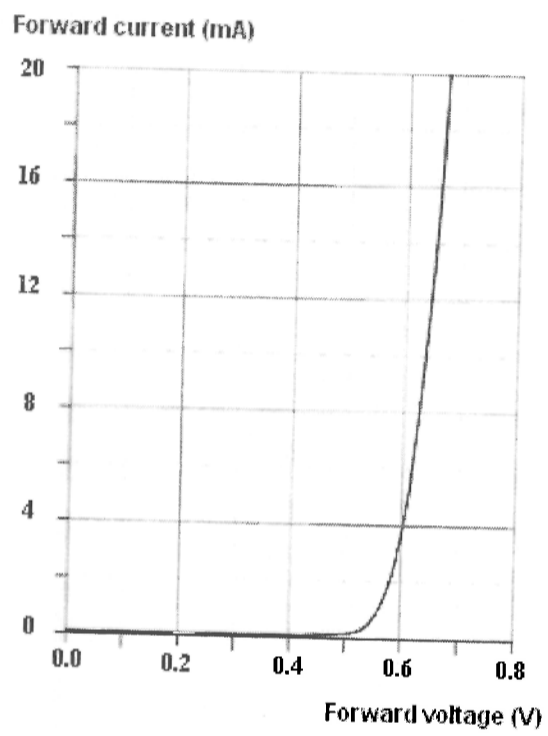


Figure O1(a)

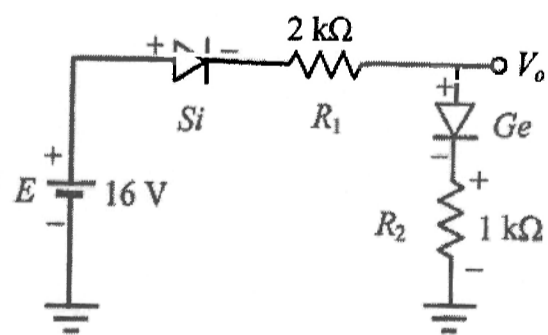


Figure O1(c)

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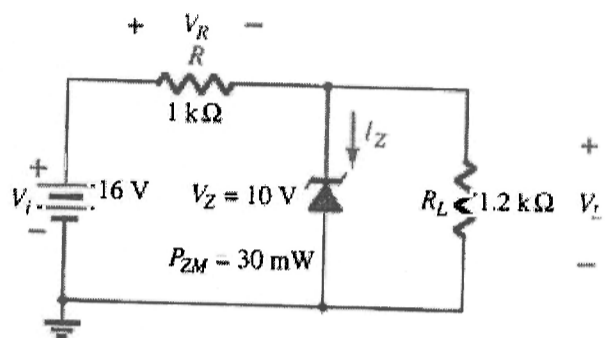


Figure O1(d)

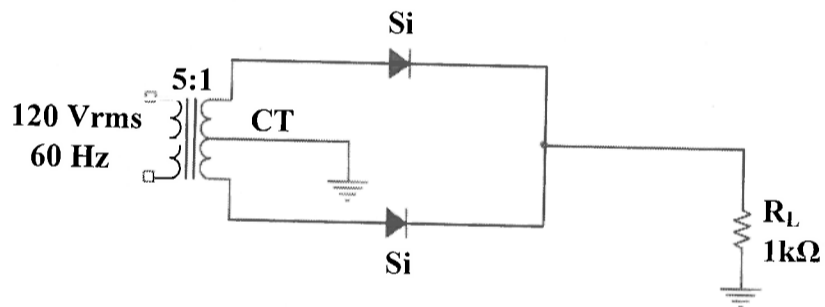


Figure O2(a)

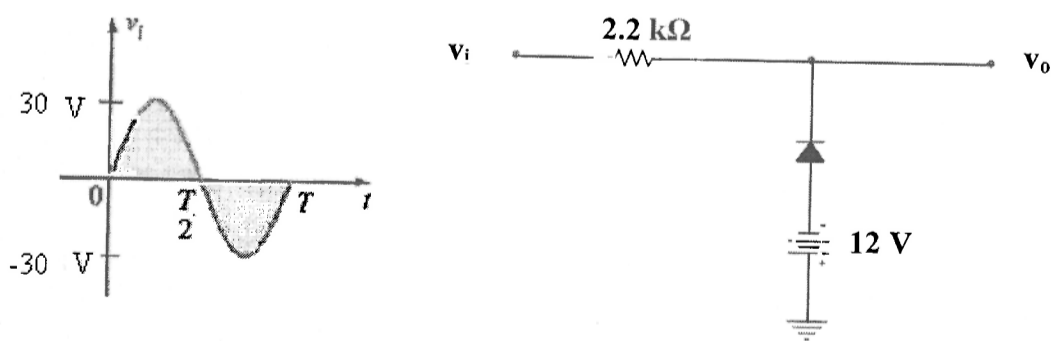


Figure O2(b)

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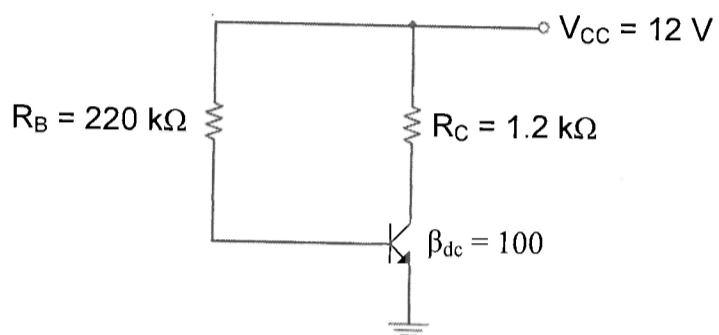


Figure O3(d)

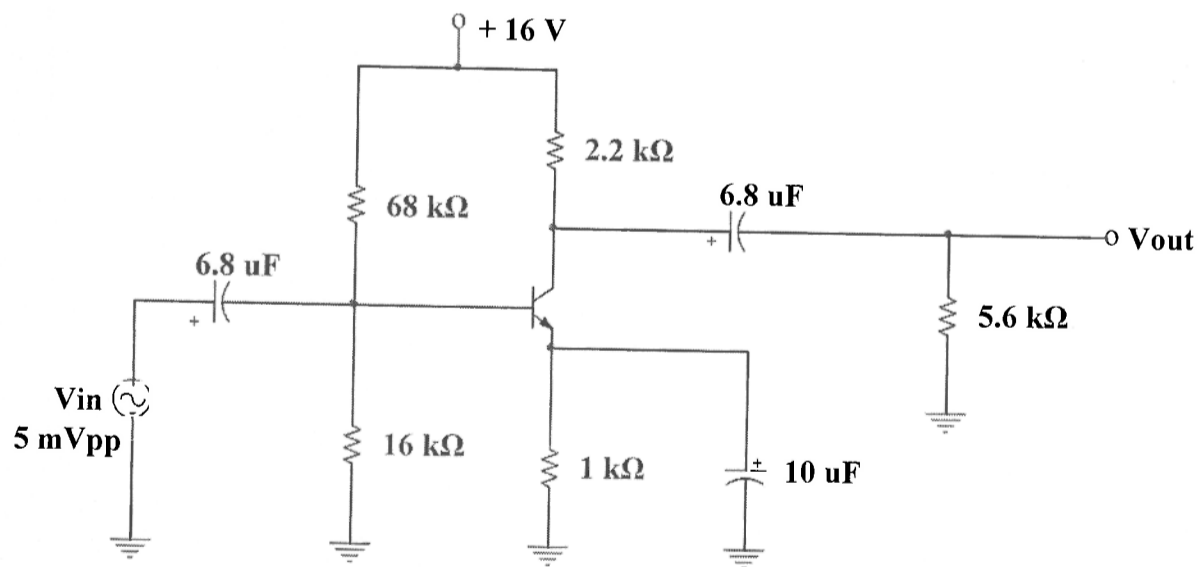


Figure O4(b)

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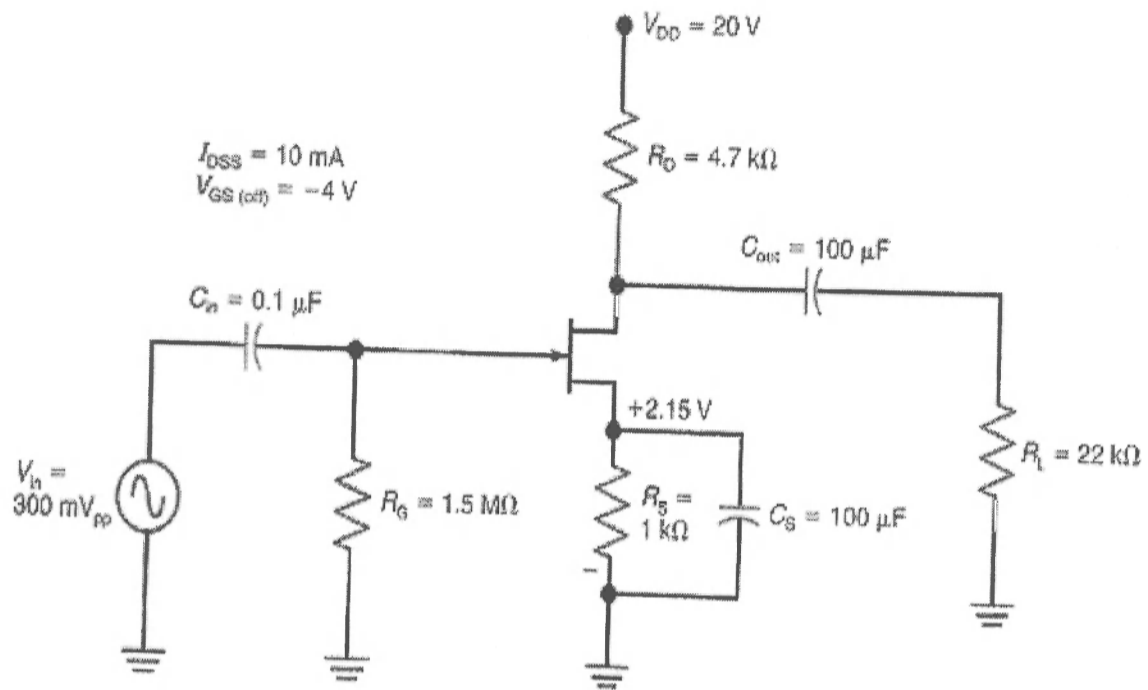


Figure Q5

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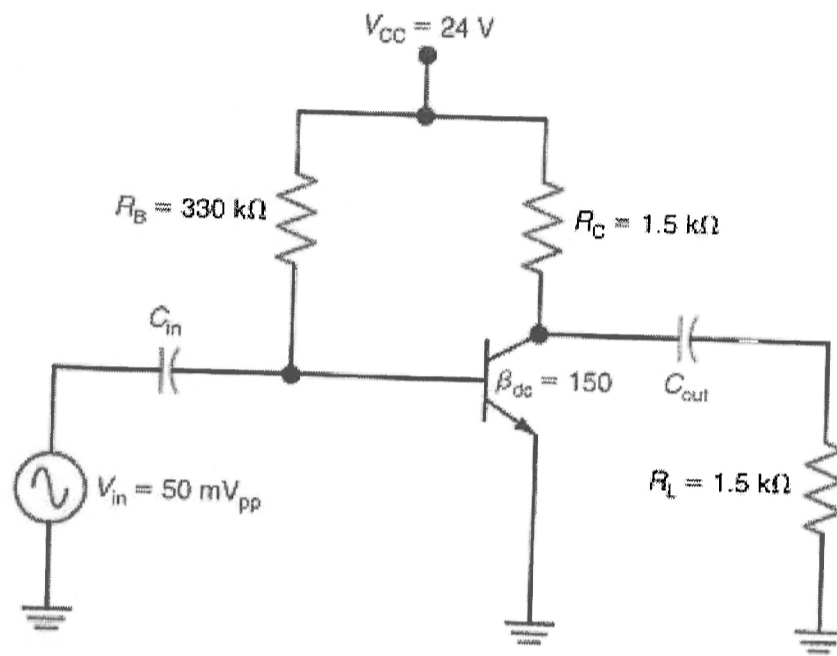


Figure O6(b)

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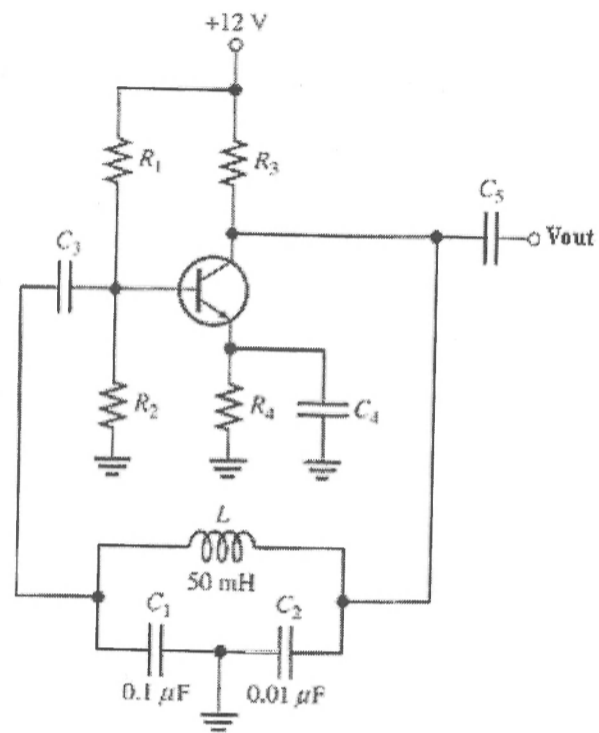


Figure Q7(b)

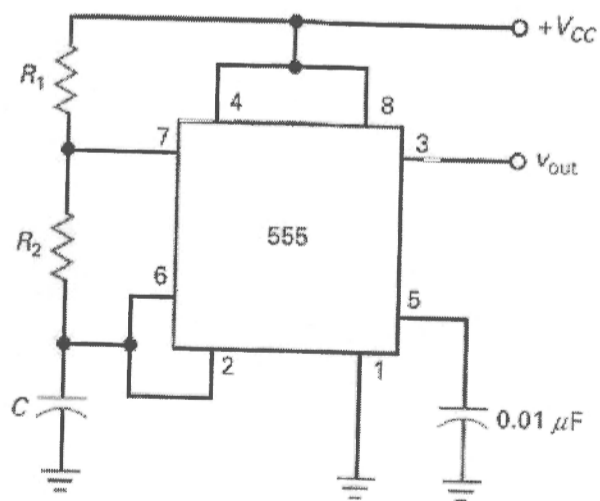


Figure Q7(c)