KATHMANDU UNIVERSITY
End Semester Examination [C]
June, 2018

JUN 18 2018

Level : B.Sc.
Year : II
Time : 2 hrs. 30 mins.

Course : PHYS 201
Semester: I
F. M. : 55

SECTION "C"
[5Q × 4 = 20 marks]

1. Describe the proper polarities for (a) forward-biasing a diode, and (b) reverse- biasing a diode. Sketch the complete graph of current versus voltage for a silicon diode with an offset of 0.7 V and a breakdown voltage of 75 V. Explain each part of the graph.

   OR

   What is a zener diode? Explain how a zener diode regulates the dc output voltage.

2. Define the dc alpha and dc beta of a transistor. Derive the equation $\alpha_{dc} = \dfrac{\beta_{dc}}{1+\beta_{dc}}$.

3. Sketch the structure of an n-channel E-MOSFET and explain their working. Draw a typical set of static drain characteristics.

4. What are the conditions required for a circuit to oscillate? Briefly describe a phase-shift oscillator.

5. Give the truth table and Boolean expression for NAND gate. Why NAND gate is called universal gate? Explain.

   OR

   Simplify the expression: (i) $Y = (\bar{A}+B)(A+B+D)\bar{D}$ and (ii) $Y = ABC+A\bar{B}\cdot\overline{(\bar{A}\bar{C})}$

SECTION "D"
[5Q × 7 = 35 marks]

6. A circuit has a Norton current of 10 mA and a Norton resistance of 10 kΩ. What is the Thevenin circuit? Using Norton's Theorem, calculate the current flowing through 12Ω resistor of the circuit shown in Figure C-1.

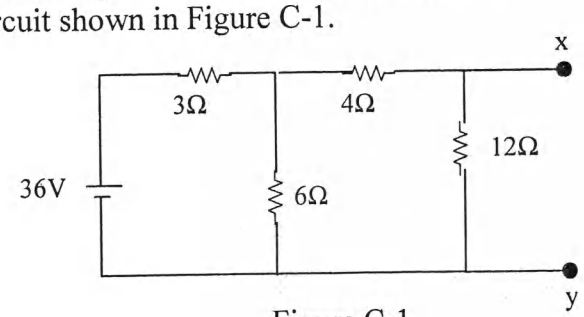

Figure C-1

OR

State and explain Thevenin's theorem. According to Maximum Power Transfer Theorem, what should be the value of load resistance R_L to abstract maximum power from the 16 V battery shown in Figure C-2? What is the value of this power?

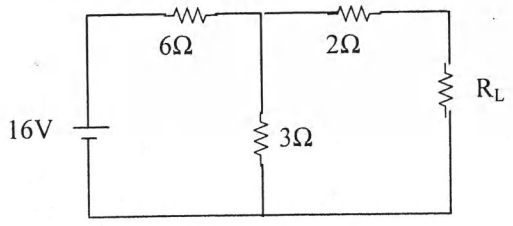

Figure C-2

7. Define common-mode rejection ratio. Describe the operation of a unity-gain summing amplifier and an op-amp integrator.

8. Draw a circuit diagram for the CE amplifier as well as its dc and ac equivalent circuits. Derive the expression for the current gain, voltage gain, and power gain. Explain why there is phase inversion between input and output.

OR

What do you understand by class A power amplifier? Draw a circuit diagram for the RC-Coupled class A amplifier. Show that the maximum possible efficiency for any RC-Coupled class A amplifier is 8.33 %.

9. The Macintosh computer processes binary numbers that are 16 bits long. If 16-bit number has all 1s, what is its decimal equivalent? Convert decimal 23.6 to a binary number. Add these 8-bit numbers: 0101 0111 and 0011 0101. Show the corresponding hexadecimal numbers.

10. Consider the circuit in Figure C-3.

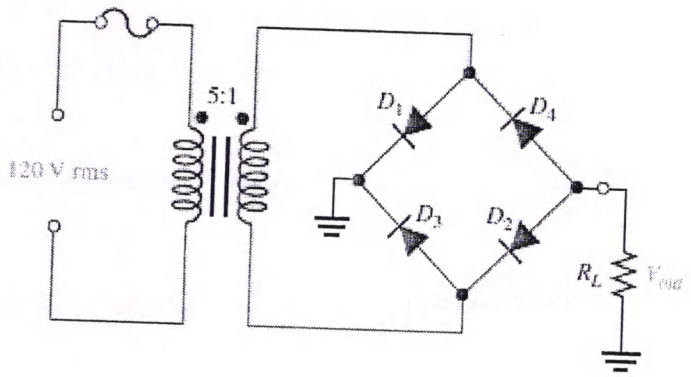

Figure C-3

(a) What type of circuit is this?
(b) What is the peak value of the secondary voltage?
(c) Find the dc load voltage.
(d) Find the dc load current for $R_L = 100\Omega$.
(e) Sketch the voltage waveform across R_L.
(f) What is the dc diode current?
(g) What is the PIV for each diode?