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MANIPAL INSTITUTE OF TECHNOLOGY

Manipal University, Manipal – 576 104

SECOND SEMESTER B.E. DEGREE END SEMESTER EXAMINATION

MAY-2010

SUBJECT: BASIC ELECTRONICS (ECE –101/102)

(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates

- Answer ANY FIVE full questions.
- Missing data may be suitably assumed.

1A With proper justification explain why input and output voltages are 180º out of phase in a single stage RC coupled amplifier.

1B Explain what is modulation index of an AM signal. Show that it is equal to $(V_{Max} - V_{Min}) / (V_{Max} + V_{Min})$, Where V_{Max} and V_{Min} are maximum and minimum values of the envelope of the AM signal. Also sketch the waveforms of AM signal for undermodulation, perfect modulation and over modulation.

1C A full wave rectifier circuit with filter has an output voltage of $10 + 0.2 \cos(2\pi 60t)$ V. Determine DC output voltage, RMS value of the ripple voltage, peak output voltage, RMS value of the output voltage, Ripple factor **(2+4+4)**

2A Explain what is meant by line regulation and load regulation. Also draw its ideal characteristics for a Zener regulator

2B Realize each of the following equations using single OPAMP. Draw the circuit diagram. Derive the input output relation and determine the component values. (i) $V_o = -5V_1$ (ii) $V_o = +5V_1$ (iii) $V_o = -(5V_1 + 7V_2)$ (iv) $V_o = V_1 - 0.5V_2$

2C An amplifier rated at 40W is connected to a 8Ω speaker. Calculate the input power required for full power output, if the power gain is 22dB. Calculate the input voltage for rated output if the amplifier voltage gain is 35 dB. **(2+5+3)**

3A Classify solids based on Energy Band diagram

3B Perform:

(i) $(7.25)_{10} - (16.75)_{10}$ using 1's complement arithmetic

(ii) $(F2A)_{16} - (731)_8$ using 2's complement arithmetic

3C Starting from expression for diode current derive the expression for dynamic resistance of a diode. Find the static and dynamic resistances of a germanium diode with 0.2 V forward bias applied, if reverse sat current is 1μA and temperature is 30°C **(2+5+3)**

4A Explain what is meant by Universal gate. Show that NOR gate can function as a universal gate.

4B Draw the input and output waveforms when a symmetrical zero average

triangular and square waveforms are respectively fed to a differentiator and integrator circuits using OPAMP. Also draw the circuits of the differentiator and integrator.

4C Draw the circuit diagram of a two stage RC coupled amplifier and also sketch the input and output voltage waveforms and frequency response. **(2+4+4)**

5A Draw the block diagram of a communication system & explain the various blocks

5B (a) The Zener Diode regulates at 50V over a range of Diode currents from 5 to 40mA. The power supply voltage V_i = 200V. Calculate R_s to allow voltage regulation from a load current of I_L = 0 up to I_{Lmax}. What is I_{Lmax}?
(b) If R_s is set as in part (a) and the load current is set at I_L = 25mA what are the limits between which V_i may vary without loss of regulation in the circuit? Also draw the circuit of Zener regulator

5C Draw the circuit of a two input NAND gate using discrete components and explain its working **(2+5+3)**

6A Derive the relationship between α_{dc} & β_{dc}, I_{CBO} & I_{CEO}

6B A full wave rectifier with 1500 μF capacitor across load resistor has maximum input voltage of 30V at 50Hz and peak to peak ripple voltage of 0.2 volt. Find the dc load current. Also draw the circuit of full wave rectifier with capacitive filter.

6C For the circuit shown in figure 1 determine the DC operating point. Transistor used is a silicon transistor with V_{BE} = 0.7V and β = 50. Do not ignore I_B.
(2+4+4)

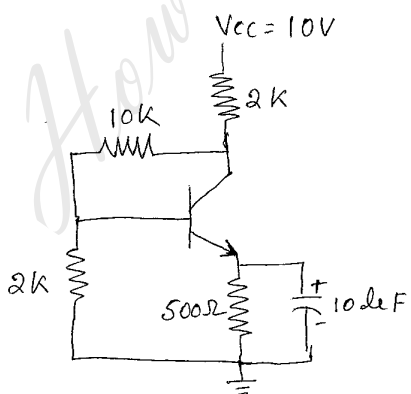

Figure 1