USN

Third Semester B.E. Degree Examination, Dec.08/Jan.09
Analog Electronic Circuits

Time: 3 hrs.

Max. Marks:100

Note : 1. Answer any FIVE full questions selecting at least 2 questions from each part.
2. Draw equivalent circuit wherever necessary.

PART - A

1 a. Explain the different diode equivalent circuits with necessary approximations if any. **(06 Marks)**

b. Explain junction capacitance with reference to a PN – diode. **(06 Marks)**

c. Sketch the waveform of V_0 for the circuit below. **(08 Marks)**
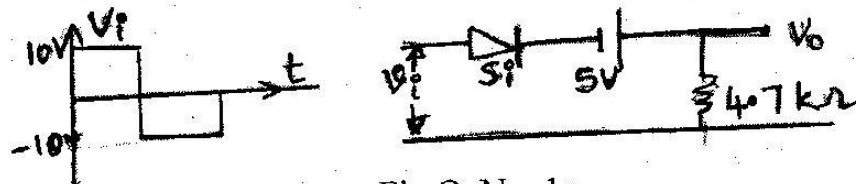

Fig Q. No. 1c.

2 a. Explain with help of load line the effect of variation of V_{CC}, I_B on Q-pt of a transistor. **(06 Marks)**

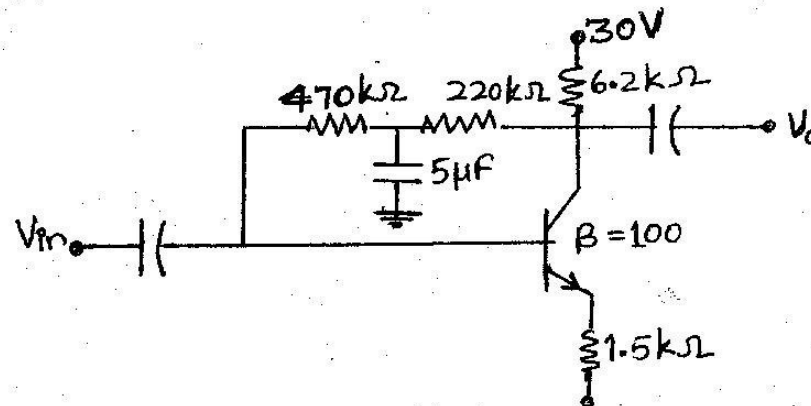b. For the voltage Feedback network below determine I_C, V_{CE}, V_C, V_E. **(08 Marks)**

Fig. Q. No. 2b

c. Derive expression for S_{ICO} for a Voltage Divider bias circuit. **(06 Marks**

3 a. Draw r_e and h – parameter models of a transistor in CE – mode. Give relation between r parameters and h – parameters. **(05 Marks**

b. A voltage divider biased amplifier has $V_{CC} = 20V$, $R_1 = 220k\Omega$, $R_2 = 56k\Omega$, $R_C = 6.8k\Omega$ $R_E = 2.2k\Omega$. The Silicon transistor used has $\beta = 180$ and $r_o = 70k\Omega$.
   Find: i) ac emitter diode resistance, re.
   ii) Input impedance.
   iii) Voltage Gain. Draw the r_e-model equivalent circuit. **(10 Marks**

c. Given a packaged amplifier below, find
   i)   Voltage gain with $R_L = 4k\Omega$.
   ii) Voltage gain with $R_L = 22k\Omega$.
   Comment on the result of Part (i) and (ii)   (05 Marks)
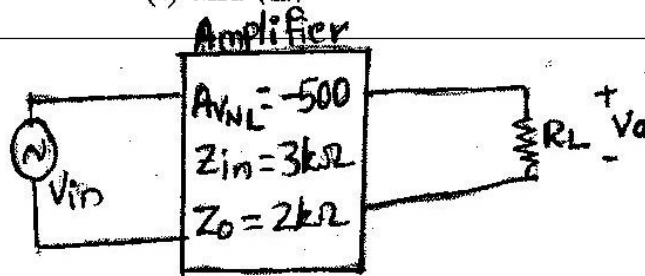

Fig. Q.No. 3c.

4 a. Explain low frequency response of BJT amplifier and give expression for lower cut-off frequency due to C_C, C_E and C_S.   (10 Marks)
   b. Obtain expression for miller effect input and miller effect output capacitance.   (10 Marks)

PART - B

5 a. With necessary equivalent diagram obtain the expression for Z_{in}, A_v, Z_o for a Darlington Emitter follower.   (08 Marks)
   b. What are the effects of negative feedback?   (06 Marks)
   c. Obtain expression for Z_{in}, Z_o for a voltage – series feedback.   (06 Marks)

6 a. What are the classification of Power Amplifiers based on the location of Q-pt? Also indicate the operating cycle in each case.   (06 Marks)
   b. Prove that the maximum conversion efficiency in class-B power amplifier is 78.5%.   (08 Marks)
   c. A power amplifier has harmonic distortions $D_2 = 0.1$, $D_3 = 0.02$, $D_4 = 0.01$, the fundamental current $I_1 = 4A$ and $R_L = 8\Omega$. Calculate the total harmonic distortion, fundamental power and total power.   (06 Marks)

7 a. Explain characteristics of a quartz crystal. With a neat diagram explain the crystal oscillator in Parallel – resonant circuits.   (10 Marks)
   b. Explain how a feedback circuit can be used as oscillator.   (04 Marks)
   c. Calculate operating frequency of a BJT phase – Shift oscillator for $R = 6k\Omega$, $C = 1500pF$, $R_C = 18k\Omega$. Determine minimum current gain of transistor required for sustained oscillations.   (06 Marks)

8 a. Define transconductance g_m. Derive expression for g_m.   (06 Marks)
   b. A JFET has $g_m = 6mV$ at $V_{GS} = -1V$. Find I_{DSS} if pintch off voltage $V_P = -2.5V$.   (04 Marks)
   c. With necessary equivalent circuit obtain the expression for A_v, Z_{in}, Z_o for a fixed-biased JFET Amplifier.   (10 Marks)