



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2010/2011
FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
IN COMPUTER ENGINEERING
SCE 313: ANALOGUE ELECTRONICS I

DATE: Monday 22nd November, 2010

TIME: 2.00 p.m. – 4.00 p.m.

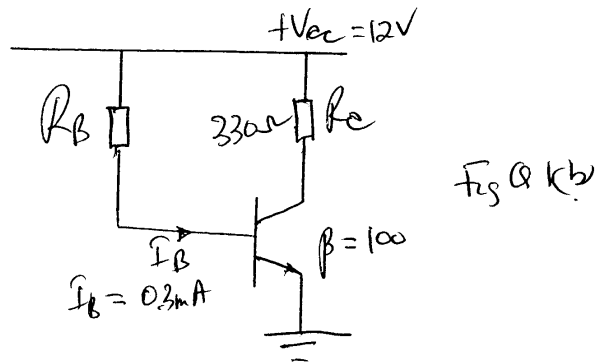
INSTRUCTIONS

Attempt Question ONE and any other TWO questions.

QUESTION ONE.

- a) i) Explain how generation of electrons and holes is achieved in semi conductors.(2Marks)
ii) Describe the effect of temperature on semi conductors. (2 Marks)
- b) i) Explain the reverse characteristics of zener diode. (2 Marks)
ii) A 1N 754 zener diode has a power dissipation rating of 500mw and a zener voltage rating of 0.8 voltage the value of I_{zm} for the device. (2 Marks)
- c) i) Explain how leakage current occurs in a common emitter bipolar junction transistor. (2 Marks)
ii) A germanium transistor used in a complementary symmetry amplifier has a collector cut off current $I_{CB} = 10\mu A$ at a temperature of $27^{\circ}C$ and $h_{fe} = 50$. Determine the collector current when the base current is 0.25mA. (3 Marks)

- d) i) Explain why biasing a transistor is necessary for a transistor to be used in any application. (3 Marks)
- ii) Determine the value of the bias resistor R_B and the stability factor for the fixed bias circuit shown in Fig. Q 1(d). (3 Marks)



- e) i) Explain how the frequency affect the frequency response of single or multi stage amplifier. (3 Marks)
- ii) For the network shown in Fig Q 1(e) determine the break frequency, sketch the asymptotes, the - 3dB points and sketch the frequency response curve. (4 Marks)
- f) i) Describe the types of feedback connection used for connecting the feedback signal from an amplifier support to its input. (2 Marks)
- ii) Explain the different classes of oscillators. (2 Marks)

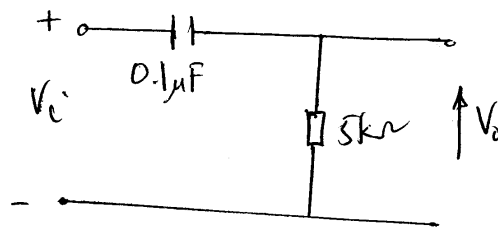


Fig Q 1(e)

QUESTION TWO

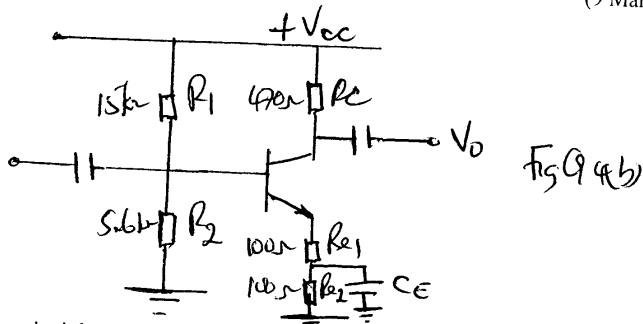
- a) Explain the h-parameter and describe how they can be determined. (8 Marks)
- b) The h- parameters of a transistor used in a common – emitter circuit are $h_{ie} = 1.0k\Omega$, $h_{re} = 10 \times 10^{-4}$, $h_{fe} = 50$ and $h_{oe} = 100 \mu mhos$. The load resistor for the transistor is $1k\Omega$ in the collector circuit. The transistor is supplied from a signal source of resistance 1000Ω . Determine the;
- Value of input and output impedances
 - Voltage and current gains in the amplifier stage.
- (12 Marks)

QUESTION THREE

- a) Describe the different classes of power amplifiers. (8 Marks)
- b) A single stage, class amplifier has $V_{cc} = 20\text{volt}$, $V_{ceo} = 10\text{ Volt}$, $I_{cq} = 600\text{mA}$ and collector load resistance, $R_L = 16\Omega$. The A.C output current varies by 300mA with the A.C input signal. Determine the ;
- Power supplied by the D.C source to the amplifier circuit.
 - D.C power consumed by the load resistor
 - D.C power developed across the load resistor
 - D.C power delivered to the transistor
 - D.C power wasted in the transistor collector
 - Overall efficiency and collector efficiency.
- (12 Marks)
- c) Show that the overall efficiency for a class B push – pull amplifier is 78.5%. (4 Marks)

QUESTION FOUR

- a) i) Explain the advantages and disadvantages of negative feedback. (4 Marks)
- ii) An amplifier has a mid band gain of 1500 and a band width of 4 MHz. The mid band gain reduces to 150 when a negative feedback is applied. Determine the value of feedback factor and the bandwidth. (7 Marks)
- b) An amplifier with current series feedback has the form shown in Fig Q 4(b). The transistor has $h_{fe} = 100$, $h_{ie} = 2k\Omega$, $R_c = 470\Omega$ and R_e consists of two 100Ω resistors one by passed by capacitor C_E . Calculate the values of voltage gain and input resistance of the amplifier with and without feedback. (9 Marks)



QUESTION FIVE

- a) i) Explain the principle of operation of tuned circuit oscillators. (2 Marks)
- ii) Derive the expression for the frequency of oscillation in a tuned - Drain FET oscillator. (3 Marks)
- b) i) Explain the principle of operation of RC oscillator (2 Marks)
- ii) Prove that the feedback β of the phase shift network is give by
- $$-\beta = \frac{1}{1 - 5\alpha^2 - j(6\alpha - \alpha^3)},$$
- Where $\alpha = \frac{1}{wRc}$ (6 Marks)
- iii) A phase - shift oscillator using an FET having $gm = 5000\mu mhos$, $r_d = 40k\Omega$ and feedback circuit resistor $R = 10k\Omega$ is designed to operate at a frequency of oscillation of 1 kHz. Determine the value of capacitance and drain resistance for $A_v > 29$ to ensure oscillator action. (6 Marks)