Third Semester (Special) Examination – 2013
ANALOGUE ELECTRONICS CIRCUIT

BRANCH : AEIE, BIOMED, CSE, EC, EEE, EIE, ELECTRICAL, ETC, IEE, IT

QUESTION CODE : D 214

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

    (a) What is the typical value of gain-bandwidth product of an OPAMP ? What is its significance in analog circuits ?

    (b) What is the difference between cascade and cascade amplifier ? Mention their importance in electronics circuits.

    (c) The output waveform of an operational amplifier as seen in CRO is 4V peak to peak with 0.04 micro second rise time (t_r). What is its slew rate ?

    (d) What is Miller capacitance ? What is its impact on input and output stage of a transistor amplifier ?

    (e) What is Barkhausen Criterion of Oscillation ?

    (f) Calculate the second harmonic distortion when the peak to peak V_{CE} as seen from oscilloscope is 21 volts and V_{CEQ} is 12 volts.

    (g) What is the bandwidth of the amplifier when the rise time is 0.1 msec ? What should be the rise time of an ideal voltage amplifier ?

    (h) The input resistance of a OPAMP in non-inverting configuration is more than OPAMP inverting configuration ? Justify.

(i) Why low beta (β) is generally preferred in power amplifiers ?

(j) Why embitter resistance (R_E) in the differential amplifier is generally taken high value ?

2. (a) In the Fig.1, if R_{b1}= 470 KΩ, R_{b2} = 270 KΩ, R_c= 6.2 KΩ, R_e=1.5 KΩ, C_b=C_c=10 μF, then find V_c, V_E, I_C, and V_{CE} when β =100 and V_{in}= 0V and V_{cc}=18 V.   7
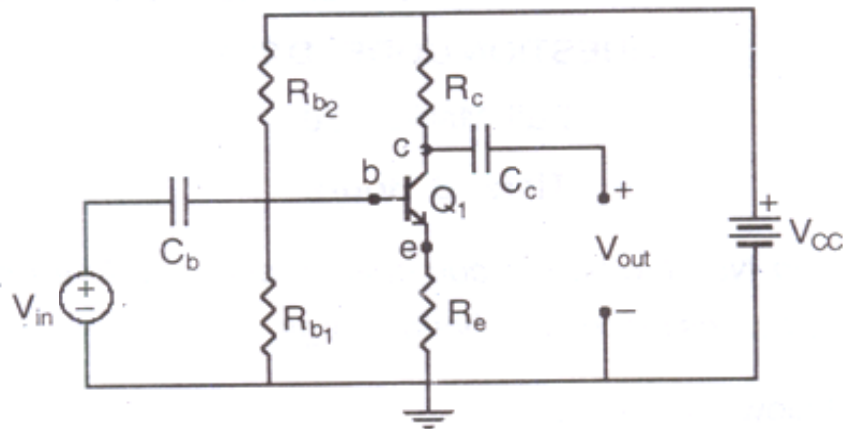
Fig. 1

(b) What is the function of C_b and C_c in the above biasing circuit ?   3

3. (a) Explain the four h-parameter of a transistor. How these parameters are found from the characteristics of the transistor amplifier ?   7

(b) Explain the importance of source resistance (R_S) and load resistance (R_L) in a transistor amplifier circuits. Justify with necessary mathematical expressions.   3

4. (a) Why +ve feedback is generally used in oscillator circuits ?   2

(b) What are the primary requirements to obtain steady oscillation at a fixed frequency ?   3

(c) Derive the input impedance (Z_i) and output impedance (Z_O) of a unit feedback voltage series –ve feedback amplifier in terms of its open-loop parameters.   5

5. (a) With a neat diagram derive the maximum efficiency of Class-B power amplifier when a sinusoidal wave signal of peak amplitude V_m is given as the input.   5

(b) For a class-B amplifier with $V_{CC} = 20$ V driving a 16-Ω load and provides an output of 10 volt rms. Then, determine the input power, output power and circuit efficiency. 5

6. (a) A transistor has a value of $\alpha = 0.99$ in a CB amplifier. Its load resistance is 4.5 Ω and dynamic resistance at the emitter junction is 50Ω. Find its voltage gain and power gain. 5

(b) Draw an emitter foilower circuit using n-p-n transistor. Derive its voltage gain using $\beta - $ re model. 5

7. (a) Establish a condition for applying maximum signal frequency to an OPAMP which has finite slew rate 'r' 5

(b) Draw a non-inverting amplifier circuit of OPAMP whose open-loop voltage gain is finite and its value A_d. Derive closed-loop voltage gain of the circuit. 5

8. Write short notes on any **two** of the following : 5 ×2

(a) High frequency effects in a transistors

(b) Nonlinear distortions in amplifier

(c) Current mirror circuit

(d) Depletion type MOSFET.

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