Registration No. : | | | | | | | | | | |

Total number of printed pages – 3

B. Tech

PCEC4201

Third Semester Examination – 2013

ANALOG ELECTRONICS CIRCUIT

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

QUESTION CODE : C- 474

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 are the basic characteristics of an instrumentation amplifier ?

   (b) Why square wave is chosen for determining the bandwidth of an amplifier ?

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

   (d) What are the small signal h-parameters that are determined from input characteristics of a transistor amplifier ?

   (e) Draw the electrical equivalent circuit of a crystal. Why an oscillator circuits using crystal gives stable frequency ?

   (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 m sec ? What should be the rise time of an ideal voltage amplifier ?

   (h) Why OPAMP is generally used in non-inverting configuration ? Justify.

   (i) How FET is used as a voltage dependent resistor (VDR) ?

   (j) Why a constant current source is used in place of R_E in the differential amplifier stage of the OPAMP ?

P.T.O.

2. (a) In the Fig. 1, if $R_1 = 470\ k\Omega$, $R_2 = 270\ k\Omega$, $R_c = 6.2\ k\Omega$, $R_E = 1.5\ k\Omega$, $C_{in} = C_o = 10\ \mu F$, $C_b = C_E = 5\ \mu F$, then find V_c, V_E, I_C, and V_{CE} when $\beta = 100$ and $V_i = 0$ V. 7

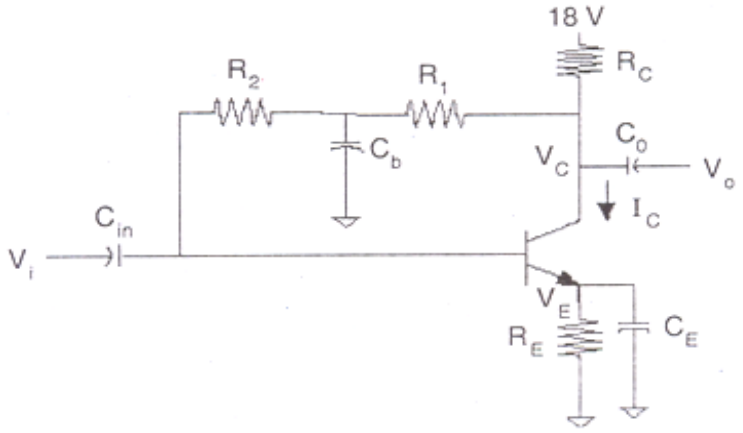

Fig. 1

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

3. (a) Derive voltage gain, current gain, input impedance and output impedance of a CE transistor amplifier circuits in terms of h-parameter. 7

(b) Explain the importance of source resistance R_S in a transistor amplifier circuits. 3

4. (a) What is Barkhausen criterion ? How this condition is used in oscillator? Explain. 4

(b) What are the primary requirements to obtain steady oscillation at a fixed frequency ? 2

(c) The open-loop gain of an amplifier changes by 5 per cents. If 10 dB negative feedback is applied, calculate percentage change of the closed-loop gain. 4

5. (a) With a neat diagram derive the efficiency of a transformer coupled Class - A power amplifier when a square wave signal of peak amplitude V_m is given as the input. 5

(b) For a Class - B amplifier providing a 22 V peak to an 8-Ω load and a power supply of $V_{CC} = 25$ V, then determine input power, output power and circuit efficiency. 5

6. (a) Derive the expression for the bandwidth of N no. of identical amplifiers connected in cascaded when individual amplifier stages have bandwidth, $BW = F_{CH} - F_{CL}$ and F_{CH}, F_{CL} are the higher and lower 3-dB frequencies respectively. 5

(b) Draw an emitter follower circuit using n-p-n transistor. Derive its voltage gain. 5

7. (a) Draw a three OPAMP based instrumentation amplifier circuits and derive its voltage gain in terms of circuit components. 5

(b) Design a OPAMP circuits in non-inverting configuration which will give an output voltage, $V_0 = 0.5V_1 - 2V_2 + 0.25V_3$, where V_1, V_2 and V_3 are three input voltages. 5

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

(a) Stability of transistor biasing

(b) Push-pull power amplifier

(c) Current mirror circuit

(d) Depletion type MOSFET.