Total No. of printed pages = 5

CAI-404/EC&D-I/4th Sem/2015/M

ELECTRONIC CIRCUITS AND DEVICES - I

Full Marks – 70

Pass Marks – 28

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer any *five* questions.

1. (a) Derive the expressions for current gain, voltage gain, input impedance and output impedance for common emitter amplifier using h-parameter model. 8

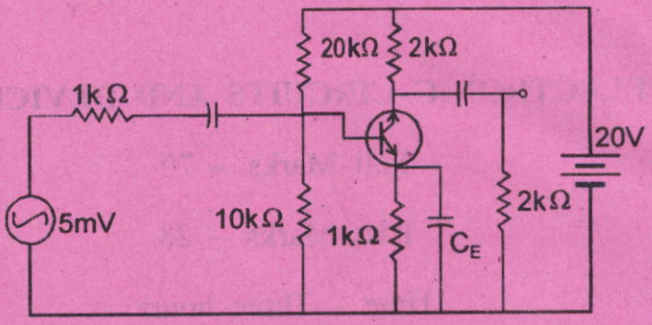
   (b) For the following circuit with given values of $h_{ie}=1k\Omega$, $h_{fe}=100$, $h_{oe}=25\mu S$ and $h_{re}=5\times10^{-4}$. 6

   Calculate :

   (i) Draw the h-parameter equivalent circuit of the amplifier.

[Turn over

(ii) Calculate the input impedance, output impedance, current gain and voltage gain.



2. (a) Draw the circuit diagram of transformer coupled class A power amplifier and describe its operation. 5

(b) A transformer coupled class A power amplifier draws a current of 200mA from a collector supply of 20V, when no signal is applied to it. Determine 5

(i) Maximum output power

(ii) Maximum collector efficiency

(iii) Power rating of the transistor.

(c) Distinguish between the following :

(i) Positive feedback and negative feedback.

(ii) JFET and MOSFET. 4

3. (a) Show that the maximum efficiency of class B operation will not exceed 78.5 percent. 6

(b) For a class B amplifier providing 25V peak signal to 15Ω load and a power supply of V_{CC}=30V, determine the input power, output power and circuit efficiency. 4

(c) Deduce the relation for voltage gain in an opamp inverting amplifier. 4

4. (a) Describe the basic principle of feedback in amplifier and deduce the relation for voltage gain with feedback. 6

(b) Explain the operation of astable multivibrator (using B.J.T) with the help of a circuit diagram. 8

In an astable multivibrator circuit with the given values.

$R_1 = R_2 = 10k\Omega$, $R_3 = R_4 = 1k\Omega$ and $C_1 = C_2 = 0.01\mu F$.

Determine

(i) The time period and frequency of circuit oscillation.

(ii) Minimum value of transister β.

5. (a) Draw the circuit diagram for the following using opamp.

(i) Adder

(ii) Subtractor

(iii) Integrator

(iv) Differentiator.

Also, mention the corresponding expressions for output voltage in each case. 8

2.

(b) With the help of a structural diagram, describe the operation of FET. Also draw the I-V characteristics for FET. 6

6. (a) A JFET has $V_P = -5V$, $I_{DSS} = 10mA$ and $I_{DS} = 2.5mA$. Determine the transconductance. 5

(b) Describe the principle of operation of a Hartley oscillator with the help of a circuit diagram. 6

(c) Determine the oscillation frequency of a transistor Hartley oscillator with circuit values $L_1 = 150\ \mu H$, $L_2 = 1.5mH$, $M=75\mu H$ and $C=150pF$. 3

7. (a) Draw the structural diagram of N-channel MOSFET and explain its working. 5

(b) Describe the operation of Biastable multivibrator using a circuit diagram. 5

(c) Draw the following gates using CMOS

(i) AND

(ii) OR 4

8. Write short notes on the following : 7×2=14

(i) Colpitt's oscillator

(ii) Multivibrator using 555 Timer IC.