Total No. of printed pages = 5

CAI-404/EC&D-I/4th Sem/2017/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) What is transistor ? Draw the circuits of various transistor configuration. 4

   (b) Why the width of the base region of a transistor is kept very small compared to other regions ? 1

   (c) How α and β are related to each other ? 1

   (d) What do you understand by transistor biasing? What is the need for bias stabilization ? 3

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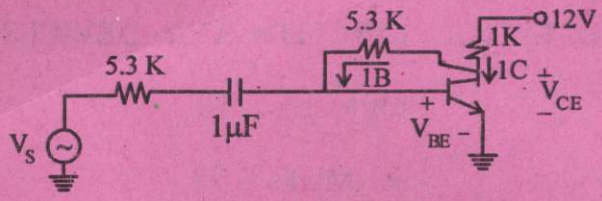
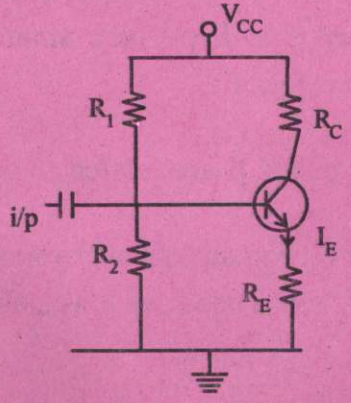
(c) In the circuit shown transistor has $\beta = 60$ and $V_{BE} = 0{\cdot}7V$. Find the operating point. 5



2. (a) Derive the expression of input resistance, voltage gain and current gain in terms of *h* parameters of a transistor amplifier. 9

(b) In the CE amplifier of figure, $I_E = 1mA$, $R_E = 1000\Omega$ and $\beta = 49$. Find the values of R_1 and R_2 such that the stability factor does not exceed 5. Assume $V_{CC} = 5$ volts and $V_{BE} = 0$. 5



3. (a) Differentiate the following : 3+3=6

(i) Voltage amplifier and power amplifier.

(ii) Class A and class B power amplifier.

(b) Find the efficiency of class A power amplifier. 4

(c) A class A, CE amplifier operates from V_{CC} = 25V, draws a no signal current of 6A and feeds a load of 30Ω through a step up transformer of $n_2 : n_1 = 2{\cdot}5$. Find effective input resistance at collector end for maximum power transfer and conversion efficiency at maximum signal input. 4

4. (a) What is an oscillator ? Give the two conditions for oscillation in feedback amplifier. 1+2=3

(b) How does Hartley oscillator differ from Colpitt's oscillator in construction ? Explain with neat diagram the working of a typical inductance type high frequency oscillator. 1+5=6

(c) A Hartley oscillator is designed with L_1 = 5mH, L_2 = 25μH and a variable capacitance. Determine the range of capacitance values, if the frequency of oscillation is varied between 850 KHz and 2030 KHz. 4

(d) The oscillator is an amplifier with _____ feedback. 1

5. (a) List the characteristics of an ideal Op-Amp. 4

(b) Define following : 4

(i) CMRR

(ii) Slew Rate

(iii) Input offset voltage

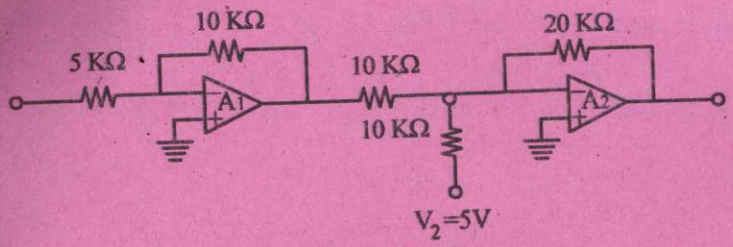
(iv) PSRR

(c) Explain how Op-Amp can be used as – 2+2=4

(i) Voltage follower

(ii) Integrator.

(d) Find output of the given circuit : 2



6. (a) Draw the circuit diagram of CMOS NAND gate and explain its operation. 6

(b) Describe construction, working and characteristics of N-channel FET. 6

(c) Calculate the minimum value of V_{DS} required for an NMOSFET to operate in pinch-off condition when V_{GS} = 1V, V_P = –2V, I_{DSS} = 10mA. Also find the corresponding drain current. 2

7. Write short notes on any *two* : 7×2=14

(i) Push-pull amplifier

(ii) Multivibrator

(iii) Deplation mode MOSFET

(iv) nMOS.