Total No. of printed pages = 7

CAI-404/EC&D-I/4th Sem/2017/N

ELECTRONICS CIRCUITS AND DEVICES–I

Full Marks – 70

Time – Three hours

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

PART – A

All questions are compulsory.

1. Answer the following multiple choice questions : $1 \times 6 = 6$

   (a) The width of the depletion layer of a junction

   (i) decreases with light doping

   (ii) increases with heavy doping

   (iii) is independent of applied voltage

   (iv) is increased under reverse bias.

(b) The cut-in voltage for Si diode is approximately

(i) 0.2 V

(ii) 0.6 V

(iii) 1.1 V

(iv) None of the above.

(c) In active region operation of a transistor

(i) emitter junction is reversed biased while collector junction is forward biased

(ii) emitter junction is forward biased while collector junction is reverse biased

(iii) Both junctions are reversed biased

(iv) Both junctions are forward biased.

(d) A FET is essentially a

(i) current driven device

(ii) voltage driven device

(iii) power driven device

(iv) None of the above.

(e) An ideal Op-Amp has band width

(i) Zero

(ii) Small

(iii) Large

(iv) Infinite.

(f) A voltage follower

(i) is non-inverting

(ii) has gain one

(iii) has no feedback resistor

(iv) all of the above.

2. Fill in the blanks : $1 \times 12 = 12$

(a) An Op-Amp is a _____ IC.

(b) The gain of non-inverting amplifier is _____.

(c) The ratio of differential gain to common mode gain is _____.

(d) The collector of transistor is _____ than emitter.

(e) The function of transistor is _____.

(f) The gate to source voltage that gives zero drain current in a FET is _____.

(g) When the collector current flows at all times during the full cycle of signal the power amplifier is _____.

(h) Overall efficiency of Class B power amplifier is _____.

(j) The oscillator is an amplifier with _____ feedback.

(k) A bistable multivibrator has _____ stable states.

(l) In common base configuration Ic = 0.96 mA and Ib = .05 mA, then the value of α is _____.

(m) The JFET can operate in _____ mode only.

3. State whether the following statements are true or false. 1×7=7

(a) Common collector configuration is generally used for impedance matching.

(b) A push pull amplifier reduces even harmonics in the output.

(c) For the amplifier to work as oscillator the magnitude of the product of the open loop gain of amplifier A and feedback factor B is less than unity.

(d) Astable multivibrator has two quasi stable states.

(e) The frequency of oscillation of an astable multivibrator depends mainly on width of input pulse.

(g) Input resistance of ideal Op-Amp is infinity.

(h) In MOSFET devices the P-channel is faster than N-channel type.

PART – B

Answer any *three* questions.

1. (a) What is power amplifier ? Differentiate between voltage amplifier and power amplifier. 1+4=5

(b) What is Class A power amplifier ? Define overall efficiency and collector efficiency of Class A power amplifier. 3

(c) A power transistor working in a Class A operation has zero signal power distortion of 10 W. If the AC output power is 4 W, find collector efficiency and power rating of transistor. 2

(d) Find overall efficiency of Class B power amplifier. 5

2. (a) What is oscillator ? Give the classification of oscillators based on the frequency ranges. 1+2=3

(b) State the conditions under which a feedback amplifier works as an oscillator. 2

(c) Describe Hartley oscillator circuit and explain its action. 7

(d) A Hartley oscillator is designed with L1=2mH, L2=20 mH and a capacitor. Determine capacitance values if the frequency of oscillation is 950 KHz. 3

3. (a) What is an Op-Amp ? Mention some of its application. 1+2=3

(b) Describe the characteristics of an ideal Op-Amp. 4

(c) Define following : 2×4=8

(i) CMRR

(ii) Slew Rate

(iii) Virtual Ground

(iv) Voltage Follower.

4. (a) Explain the operation of N channel FET with static characteristics curve. 8

(b) Differentiate between JFET and BJT. 2

(c) Write short notes on any *one* of the following : 5

(i) MOSFET

(ii) PMOS

(iii) Multivibrator.