Total No. of printed pages = 5

Et-305/AE-I/3rd Sem/2017/N

# ANALOG ELECTRONICS – I

Full Marks – 70

Time – Three hours

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

## PART – A

Marks – 25

*All* questions are compulsory.

1. Fill in the blanks : 1×10=10

   (a) A vacuum diode can be used as a _____.

   (b) When an electron jumps from a higher orbit to a lower orbit, it _____ energy.

   (c) In a type semiconductor _____ are the minority carriers.

   (d) If pn junction is forward biased its resistance is _____.

   (e) A full wave rectifier is _____ efficient than a half wave rectifier.

[Turn over

(f) The output of a rectifier contains _____ and _____.

(g) A transistor has _____ pn junctions.

(h) The base of a transistor is _____ doped.

(i) The intersection of the DC load line with the given base current curve is the _____.

(j) RC coupling is used for _____ amplification.

2. Select the correct answer : $1 \times 10 = 10$

(a) The screen grid potential is somewhat (lower/higher) than plate potential.

(b) The addition of pentavalent impurity to a semiconductor creates (holes/electrons).

(c) The frequency response of transformer coupling is (poor/good/excellent).

(d) An oscillator produces (damped/undamped) oscillations.

(e) An oscillator is a (rotating/non-rotating) device.

(f) Negative feedback reduces (distortion/stability) in amplifiers.

(g) The best frequency response is of (RC/ Direct/ Transformer) coupling amplifiers.

(h) A Zener diode is operated in the (Breakdown/ Forward biased characteristics) region.

(i) The maximum efficiency of a full wave rectifier is (40/81.2/90.1) per cent.

(j) The function of a transistor is to (amplify/ rectify).

3. Answer true or false : 1×5=5

(a) Forward resistance of a diode is quite large as compared to reverse resistance.

(b) The current amplification factor in a CE configuration is given by $\alpha$.

(c) The RC coupled amplifier provides excellent audio fidelity over a wide range of frequency.

(d) Semiconductor devices are sensitive to temperature variations.

(e) When the feedback energy is out of phase with the input signal, it is called positive feedback.

## PART – B

Marks – 45

Answer any *five* questions.

4. (a) Classify vacuum tubes and explain the working principle of any one among them.

   (b) Prove that $\mu = r_p \times g_m$. 2+4+3=9

5. (a) Explain the process of formation of an extrinsic semiconductor with arsenic being the impurity to be added.

   (b) Also explain the formation of the potential barrier. 5+4=9

6. (a) What are rectifiers ? Discuss the working principle of a half wave rectifier .

   (b) Also derive an expression for the efficiency of such a rectifier. 1+4+4=9

7. (a) Draw the input and output characteristic curve for a CE configuration.

   (b) Also derive a relationship between $\alpha$, $\beta$, and $\gamma$. 5+4=9

8. (a) Explain the process of amplification of a signal by a single stage transistor amplifier.

(b) Define and explain the terms : Gain, Frequency response, and bandwidth in a multistage amplifier. 3+6=9

9. (a) Define positive and negative feedback.

(b) Derive an expression for the gain of an amplifier with feedback.

(c) Discuss in brief the process of generation of oscillations in a tank circuit. 2+4+3=9

10. Write short notes on any *two* : 4½×2=9

(i) Zener diode.

(ii) Filters.

(iii) Hartley Oscillator.