2013

ANALOG ELECTRONIC CIRCUITS

Time Allotted : 3 Hours | *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) Gain of the emitter follower is approximately equal to

a) α b) $\beta + 1$

c) β d) $\frac{1}{(1-\alpha)}$.

ii) To improve the efficiency of amplifier we have to reduce

a) the power dissipation rating

b) supply voltage

c) the load power

d) unwanted power loss.

iii) An instrumentation amplifier

a) is a differential amplifier

b) has a gain less than one

c) has very high output impedance

d) has low CMRR.

iv) Saturation region of a BJT implies

a) base-emitter junction forward biased, base-collector junction reverse biased

b) base-emitter junction forward biased, base-collector junction forward biased

c) base-emitter junction reverse biased, base-collector junction reverse biased

d) none of these.

v) A differential amplifier has the differential amplifier gain of 100. If its CMRR = 240, then the common mode gain is

a) 0.24 b) 0.417

c) 24000 d) 1.

vi) A full-wave rectifier supplies 0.2A current at 30V DC. The ripple factor to be expected when two 100 mF capacitor and one 5H inductor are used in a π-filter with a 50Hz supply is

a) 0.0076% b) 0.076%

c) 0.76% d) 76%.

vii) The *Q* point in a voltage amplifier is selected in the middle of the active region because

a) it gives better stability

b) the circuit needs a better small signal DC voltage

c) the biasing circuit needs a small DC voltage

d) it gives distortion-less output.

viii) The current gain of a bipolar transistor drops at high frequencies because of

a) transistor capacitances

b) high current effects in the base

c) parasitic inductive elements

d) the early effect.

ix) The gain required for sustained oscillation in Wien-bridge oscillator is

a) 29 b) 3

c) 1 d) 1.5.

x) A *dc* power supply has no-load voltage of 30V and a full-load voltage of 25V at full-load current of 1A. Its output resistance & load regulation. respectively are

a) 5 Ω & 20%

b) 25 Ω & 20%

c) 5 Ω & 16.7%

d) 25 Ω & 16.7%.

xi) The output voltage of an IC7915 is

a) 15V b) – 15V

c) 79V d) – 79V.

xii) An instrumentation amplifier has a high

a) Supply voltage

b) Power gain

c) CMRR

d) Output impedance.

GROUP – B
(Short Answer Type Questions)
Answer any *three* of the following. 3 × 5 = 15

2. Write down the effect of base width modulation. Explain the compensation technique using Thermistor.

3. What are the criteria of a good instrumentation amplifier ? Why is it needed ? Draw the circuit diagram of an instrumentation amplifier.

4. What is a multivibrator ? Explain the operation of a monostable multivibrator using 555 timer and draw the output voltage waveform.

5. What are the differences between series and shunt regulators ? Draw a circuit of a shunt regulator and explain its operation.

6. Draw and explain the Schmitt Trigger circuit using OP-AMP.

GROUP – C
(Long Answer Type Questions)
Answer any *three* of the following. 3 × 15 = 45

7. Explain Barkhausen criteria for oscillation and find out frequency of oscillation in phase shift oscillator and also prove that the amplifier gain in a phase shift oscillator is 29 for sustained oscillation. Discuss the advantages of Switched Mode Power Supply (SMPS) over regulated power supply. Using a circuit diagram explain in short the operation of SMPS. 2 + 6 + 7

8. What do you mean by regulation ? Draw and explain a CLC or π filter. Draw and explain the operation of shunt regulated power supply. 2 + 4 + 4 + 5

9. Explain the operation of a Class *B* push-pull amplifier and prove that the efficiency is 78.5%. What is cross-over distortion in Class *B* amplifier and how can we remove the problem ? Compare different types of power amplifier in respect of efficiency and phase response. 7 + 4 + 1 + 3

10. In what respects Class *B* push-pull amplifier configuration is better than Class *A* push-pull amplifier ? What are the major drawbacks of Class *B* operation and how is it remedied ? Prove that the maximum efficiency of a Class *B* amplifier is 78.5%. What is the function of tuned amplifier ?

3 + 3 + 5 + 4

11. Write short notes on any *three* of the following : 3 × 5

a) Clamping and clipping circuit

b) Tuned amplifier

c) Antilog amplifier

d) Precision rectifier

e) Triangular wave generator.