EC(EE)-301

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. Answer any *ten* questions. 10×1 = 10

(i) Thermal runway in a transistor based in the active region is due to the
(A) heating of the transistor
(B) change in β which increases with temperature
(C) base emitter voltage which decreases with rise in temperature
(D) change in reverse collector saturation current due to rise in temperature

(ii) The effect of introducing R_E in the CE amplifier is to
(A) increase the voltage gain (B) decrease the voltage gain
(C) increase the current gain (D) decrease the current gain

(iii) The maximum efficiency of transformer coupled class-A power amplifier is
(A) 25% (B) 50% (C) 79% (D) 100%

(iv) Compared to voltage amplifier power amplifier handle signal which is
(A) small (B) very small (C) large (D) none of these

(v) For a wide range of oscillations in the audio range, the preferred oscillator is
(A) Hartley (B) phase shift
(C) wien bridge (D) Hartley and Colpitt

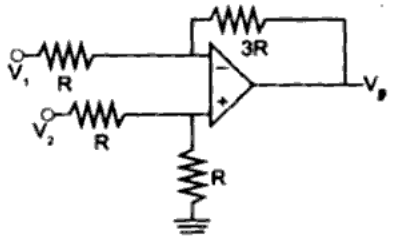
(vi) Astable multivibrator may be used as
(A) frequency to voltage converter (B) voltage to frequency converter
(C) squaring circuit (D) comparator circuit

(vii) Negative feedback in an amplifier results in
(A) more gain, more bandwidth (B) more gain, less bandwidth
(C) less gain, more bandwidth (D) less gain, less bandwidth

(viii) Transformer couple class A power amplifier provides very high frequency because the
(A) collector voltage is stepped up
(B) dc resistance in the collector circuit is low
(C) large signal amplifier
(D) none of these

(ix) 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

(x) The value of V_o is given for the following circuit is given by



(A) $-3V_1 + 2V_2$ (B) $-3V_2$ (C) $-2.25V_1 + 1.5V_2$ (D) $-2V_1 + 3V_2$

(xi) In a logarithmic amplifier, the logarithmic effect of the input is obtained from
(A) nonlinear device, like diode or transistor
(B) negative feedback
(C) the op-amp itself
(D) the inverting input terminal

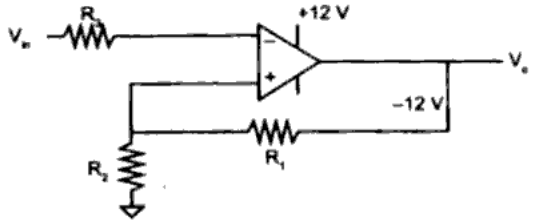
(xii) Frequency for RC phase shift oscillator is given by
(A) $1/(2\pi RC)$ (B) $1/(2RC)$ (C) $1/(2\pi\sqrt{LC})$ (D) $1/(2\pi\sqrt{6}\,RC)$

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. Explain the operation of Inverting Full wave Precision rectifier and draw its input and output waveform. 5

3. Define stability factor. Explain any compensation technique using Thermistor. 2+3

4. 

5

In a Schmitt-trigger circuit shown is $R_1 = 50\ k\Omega$, $R_2 = 10\ k\Omega$, saturation voltage ± 14 V, $V_{in} = 12\sin \omega t$. Find

(i) upper threshold voltage

(ii) lower threshold voltage

(iii) hysteresis width and show output voltage waveform.

5. What are the advantages of class-B push-pull amplifier over class-A amplifier. State two difference between voltage amplifier and power amplifier. 3+2

6. (a) What is PLL? 2

(b) Define the terms 1+1+1

(i) Capture range

(ii) Lock-in range

(iii) Pull-in time

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 4

7. (a) Write down the criteria of a good instrumentation amplifier. Draw the circuit of an instrumentation amplifier and explain its operation. 2+

(b) What is the multiplier? Explain the operation of multiplier as divider and square rooter. 1+

8. (a) Draw and explain voltage to current converter (Grounded load).

(b) Explain the op-amp integrator circuit.

(c) Explain logarithmic amplifier with circuit diagram.

9. (a) Give internal block diagram of 555 and explain the function of each block.

(b) Explain the operation of monostable multivibrator using IC555.

(c) Draw the circuit of an astable multivibrator with 50% duty cycle output using 555 timer.

10.(a) Draw and explain the block diagram of current series feedback amplifier. Mention the effect of negative feedback on gain. 4+

(b) Write down the Barkhausen criterion for sinusoidal oscillation.

(c) Obtain the expression for output frequency and condition to sustain oscillation of a Wein bridge oscillation.

(d) What are the advantages and disadvantages of Wein bridge oscillation.

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

(a) Push-pull amplifier

(b) Current mirror circuit

(c) Tuned amplifier

(d) Switch Mode Power Supply (SMPS)

(e) Voltage regulator

(f) VCO