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5/12/2022

Roll No. (A)

**National Institute of Technology, Hamirpur (HP)**

Name of Examination: B.Tech. End Semester Examination Nov./ Dec. 2022

Branch: ECE/ ECE (Dual-Degree)

Semester: 3<sup>rd</sup>

Subject: Analog Electronics

Subject Code: EC-212

Time: 3 Hours

Maximum Marks: 50

Note: Attempt all questions

- Q. 1(a)** Using common emitter transistor amplifier circuit and giving ac output current-voltage waveforms, discuss and indicate the cut-off, saturation and active regions over the transistor output characteristics. (5)
- (b)** How Miller capacitance effect accounts for an increase in the equivalent input capacitance of an inverting voltage amplifier? (5)
- Q. 2** Four identical cascaded stages have an overall upper 3 dB frequency of 20 kHz and a lower 3 dB frequency of 20 Hz. (10)
- (a)** Determine  $f_1$  and  $f_2$  of each stage.
- (b)** Find the frequency range over which the voltage gain is down by less than 2 dB from its midband value.
- Q. 3** Sketch the circuit of a push-pull Class B transistor amplifier in the common-collector configuration (a) with an output transformer, (b) without an output transformer. Explain their operation and in particular show that no even harmonics are present. (10)
- Q. 4(a)** Illustrate practical circuits realizing voltage-series and current-shunt feedback. Derive the expressions of voltage gain/ current gain, input resistance, and output resistance. (5)
- (b)** An voltage amplifier with feedback gives a voltage gain equal to 40 V/V. In order to produce a specific output voltage, the input voltage required without feedback is 0.1 V. When feedback has been provided the input must be increased to 2.4 V to produce the same output. Calculate the feedback factor. (5)
- Q. 5(a)** Explain Barkhausen criteria for oscillations. Derive the frequency of oscillation for Wien-bridge oscillator. (5)
- (b)** Draw the circuit diagram of an LC tank based oscillator such that resonant frequency remains unaffected from the internal capacitance of the transistor. (5)

\*\*\*\*End of Question Paper\*\*\*\*