

Code : 041404

(2)

B.Tech 4th Semester Exam., 2018

ANALOG ELECTRONICS

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer from the following
(any seven) : $2 \times 7 = 14$

(a) When there is no base current in a transistor switch, the output voltage from the transistor is

- (i) low
- (ii) high
- (iii) unchanged
- (iv) unknown

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(b) If the emitter resistance increases, the collector voltage

- (i) decreases
- (ii) stays the same
- (iii) increases
- (iv) breaks down the transistor

(c) Consider 49 cascaded amplifiers having individual rise time as 2 n sec, 3 n sec, ... 50 n sec. The input waveform rise time is 1 n sec. Then the output signal rise time is given by (assume output signal rise time is measured within 10 percent range of the final output signal)

- (i) 39-28 μ sec
- (ii) 2-28 μ sec
- (iii) 0-228 μ sec
- (iv) 39-28 μ sec

(d) Which capacitance(s) in hybrid π model represent(s) the storage of excess minority carriers at the base emitter junction?

- (i) Diffusion capacitance
- (ii) Transition capacitance
- (iii) Both (i) and (ii)
- (iv) None of the above

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(e) Why do the internal capacitances of transistor at low frequencies treated as open circuits by completely neglecting their effects in analysis?

- (i) Due to high reactance
- (ii) Due to low reactance
- (iii) Due to moderate reactance
- (iv) None of the above

(f) Which among the below assertions is not a salient feature/property of CE amplifier?

- (i) High voltage gain
- (ii) High current gain
- (iii) High input resistance
- (iv) High output resistance

(g) In a power amplifier, the collector current flows for 270° of the input cycle. The operation is

- (i) class A
- (ii) class B
- (iii) class AB
- (iv) class C

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(h) Which capacitor is used to block DC portion by allowing to pass only AC portion of the amplified signal to load?

- (i) Input coupling capacitor
- (ii) Bypass capacitor
- (iii) Output coupling capacitor
- (iv) All of the above

(i) When the circuit is switched on, the loop gain of an Wien bridge oscillator is

- (i) 1
- (ii) more than 1
- (iii) less than 1
- (iv) about 0.5

(j) If Q of an $L-C$ circuit increases, then bandwidth

- (i) increases
- (ii) decreases
- (iii) remains the same
- (iv) insufficient data

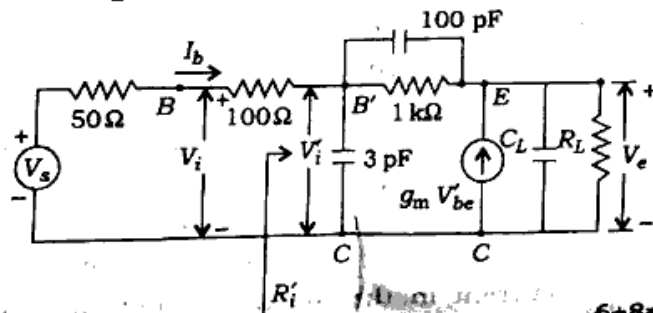
2. (a) Explain the frequency distortion in amplifier and list the various causes for distortion.

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- (b) Draw the approximate small-signal equivalent circuit at low frequency for common-collector amplifier with load resistance R_L . Compute the input resistance in terms of h parameters.

7+7=14

3. (a) Draw and explain the working of low-frequency small-signal equivalent circuit of common base BJT.
- (b) Compute the input impedance R_i using the equivalent circuit diagram given in figure below at frequency $f = 30$ MHz, where $g_m = 50$ mA/V, $R_L = 2$ k Ω and $C_L = 20$ pF.



6+8=14

4. (a) Draw and explain the working of Bootstrapped Darlington circuit.
- (b) Explain the f_β and f_T , which are bandwidths of the circuit and short-circuit current-gain bandwidth product, respectively.

7+7=14

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5. (a) The input to a low-pass amplifier is a pulse of width t_p . Sketch the output waveform and explain the intermediate steps involved to achieve the output.
- (b) What must be the relationship between t_p and high 3-dB frequency f_H in order to amplify the pulse without excessive distortion?
- 10+4=14
6. (a) Compute overall upper 3-dB frequency for four interacting stages amplifier having individual stage upper 3-dB frequency, $f_1 = 4$ MHz, $f_2 = 4.2$ MHz, $f_3 = 4.1$ MHz and $f_4 = 3.9$ MHz.
- (b) Define tilt. How is the tilt related to the low 3-dB frequency f_L ?
- 8+6=14
7. (a) Explain thermal and shot noises associated to the amplifier and briefly discuss the thermal-resistance noise voltage and mean-square shot-noise current in the context of thermal and shot noises respectively.
- (b) Compute the expression for current gain using small-signal equivalent circuit at high frequency for common-source FET amplifier with load resistance R_L .
- 7+7=14

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8. (a) Explain the working of phase-shift oscillator.
- ✓ (b) Derive expression for the oscillation frequency of a Colpitts oscillator and compute its value for given $L = 10 \text{ mH}$, $C_1 = 24 \text{ nF}$ and $C_2 = 240 \text{ pF}$. $7+7=14$
9. (a) ✓ Explain the working of class-B push-pull amplifier and compute the maximum conversion efficiency.
- (b) ✓ Compute the bandwidth for single-tuned BJT amplifier using one parallel tuned circuit as load. $7+7=14$
