B.Tech 4th Semester Exam., 2015

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. Answer any *seven* of the following : 2×7=14

(a) What are the salient features of hybrid parameters?

(b) How is BJT different from JFET?

(c) What is intermodulation distortion in amplifier?

(d) Write down the transfer function of a simple RC low-pass circuit.

(e) What is the primary function of a phase inverter circuit? Where is it required?

(f) "Class C amplifier is a voltage-tuned amplifier." Justify.

(g) What are the sources of thermal noise?

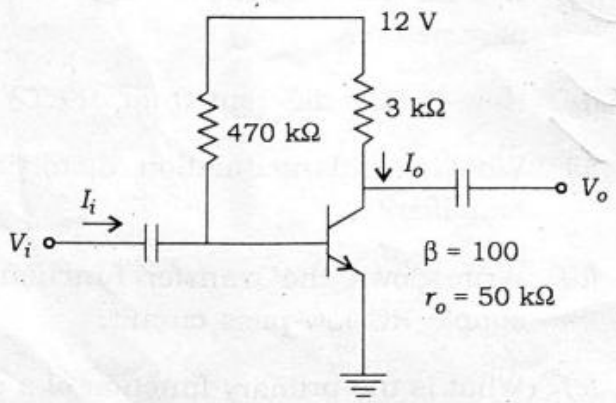
(h) Why are power transistors provided with heat sinks?

(i) How are amplifiers classified based on the biasing condition?

(j) Define stegger-tuned amplifier.

2. (a) Draw the equivalent circuit for the CE and CC configurations subject to the restriction that input is open-circuited. Show that output impedances of the two circuits are identical. 8

(b) For a network shown in the figure below, determine r_e, Z_i, Z_o and A_v : 6



3. (a) Draw the high-frequency π model of a transistor and explain it. 6

(b) Following low-frequency parameters are known for a given transistor at $I_C = 10$ mA, $V_{CE} = 10$ V and at room temperature :

h_{ie} = 500 ohms, $h_{re} = 10^{-4}$

$h_{oe} = 4 \times 10^{-5}$ A/V, $h_{fe} = 100$

At some operating point, $f_T = 50$ MHz and $C_{ob} = 3$ pF. Compute the values of all the hybrid-π parameters. 8

4. (a) Discuss the analysis of emitter follower circuit at high frequencies. 8

(b) In an amplifier, the output power is 1·5 W at 2 kHz and 0·3 W at 20 Hz, while the input power is constant at 10 mW. Determine by how many decibels the gain at 20 Hz is below that at 2 kHz. 6

5. (a) Sketch the response of an amplifier to a low-frequency square wave. Define the term 'tilt'. How is the tilt related with the low 3 dB frequency f_L? 7

(b) Three identical cascaded stages have an overall upper 3 dB frequency of 20 kHz and a lower 3 dB frequency of 20 Hz. What are f_L and f_H of each stage? Assume non-interacting stages. 7

6. (a) Explain how oscillations are initiated at switch on the system and latter sustained in RC and LC oscillators. 6

(b) Draw the RC phase-shift oscillator circuit using BJT and find the minimum gain required for oscillation and expression for oscillation frequency. 8

7. (a) Derive and explain the Friis transmission formula. 7

(b) Find the maximum effective area of a $\lambda/2$ wire dipole operating at 30 MHz. How much power is received with an incident plane wave of strength 2 mV/m? 7

8. (a) A tank circuit has a capacitor 100 pF and an inductor 100 µH. The resistance of the inductor is 5 Ω. Determine the resonant frequency, impedance at resonance, Q factor and bandwidth of this tank circuit. 7

(b) Show that the maximum conversion efficiency of a class B amplifier is 78·5%. 7

9. Write short notes on any *two* of the following : 7×2=14

(a) Cascade amplifier

(b) Bootstrapping in emitter follower

(c) Ideal voltage and transresistance amplifiers

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