Code : 100302

B.Tech 3rd Semester Exam., 2019
(New Course)

ANALOG ELECTRONIC CIRCUITS

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.*

(v) Symbols and notations carry their usual meanings.

1. Choose the correct answer of the following (any *seven*) : 2×7=14

(a) For a base current of 10 μA, what is the value of collector current in common emitter if $\beta_{dc} = 100$?

(i) 10 μA

(ii) 100 μA

(iii) 1 mA

(iv) 10 mA

(b) Which of the following oscillators is suitable for frequencies in the range of MHz ?

(i) RC phase shift

(ii) Wien bridge

(iii) Hartley

(iv) Both *(i)* and *(iii)*

(c) If an amplifier with gain of −1000 and feedback factor $\beta = -0{\cdot}1$ had a gain change of 20% due to temperature, the change in gain of the feedback amplifier would be

(i) 10%

(ii) 5%

(iii) 0·2%

(iv) 0·01%

(d) In a CE amplifier, the input impedance is equal to the ratio of

(i) a.c. base voltage to a.c. base current

(ii) a.c. base voltage to a.c. emitter current

(iii) a.c. emitter voltage to a.c. collector current

(iv) a.c. collector voltage to a.c. collector current

(e) For a system to work, as oscillator the total phase shift of the loop gain must be equal to

(i) 90°

(ii) 45°

(iii) 270°

(iv) 360°

(f) A CB amplifier has $r_e = 6\Omega$, $R_L = 600\Omega$ and $\alpha = 0 \cdot 98$. The voltage gain is

(i) 100

(ii) $600 \times 0 \cdot 98$

(iii) 98

(iv) 6

(g) The open-loop gain of an amplifier is 200. If negative feedback with $\beta = 0 \cdot 2$ is used, the closed-loop gain will be

(i) 200

(ii) 40·12

(iii) 4·878

(iv) 2·2

(h) An RC oscillator uses

(i) one RC combination

(ii) two RC combinations

(iii) at least three combinations

(iv) Either (i) or (ii)

(i) The main advantage of CMOS circuit is

(i) high gain

(ii) high output impedance

(iii) low power consumption

(iv) high gain and high output impedance

2. Attempt any *two* of the following : 7×2=14

(a) Derive an expression for input impedance, output impedance, voltage gain and current gain of the transistor amplifier using *h*-parameters.

(b) Determine voltage gain and current gain of emitter follower, where $V_{CC} = 10$ V, $R_B = 100$ K, $R_E = 1$ kΩ, $h_{ie} = 1 \cdot 1$ kΩ, $h_{fe} = 100$, using approximate hybrid model.

(c) Derive an expression for output resistance and voltage gain of fixed bias FET amplifier.

3. Attempt any *two* of the following : 7×2=14

(a) Calculate voltage gain of self-bias FET amplifier. The circuit uses $R_D = 2$ kΩ, $R_S = 1$ kΩ, $r_d = 40$ kΩ, $g_m = 2$ mA / V, $R_G = 2$ MΩ.

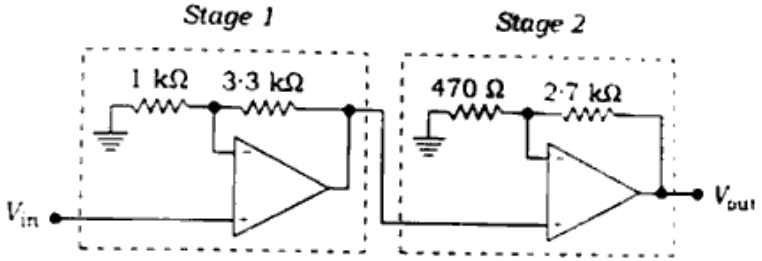
(b) Determine input resistance and output resistance of voltage series feedback amplifier.

(c) Briefly explain the characteristics of negative feedback amplifier.

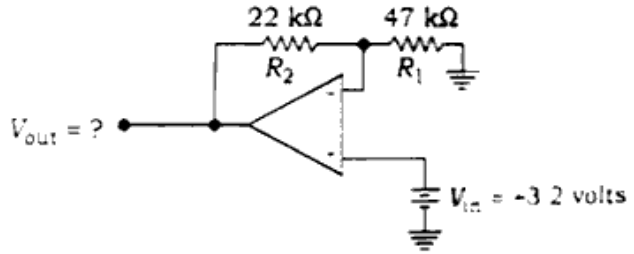
4. Attempt any *two* of the following : 7×2=14

(a) With a neat diagram, explain the construction and operation of depletion MOSFET. Also write the drain and transfer characteristics.

(b) Calculate the voltage gain for each stage of this amplifier circuit (both as ratio and in units of decibels), then calculate the overall voltage gain :



(c) Calculate the voltage gain of this amplifier circuit (A_V) :



5. Attempt any *two* of the following : 7×2=14

(a) Obtain the expression for overall lower and higher cut-off frequency for a multistage amplifier.

(b) Explain circuit diagram of conventional full-wave rectifier.

(c) With neat circuit diagram, explain the working of Zener diode and *I-V* characteristics.

6. Attempt any *two* of the following : 7×2=14

(a) Define the following :

(i) Common mode rejection ratio (CMRR)

(ii) Gain bandwidth product

(iii) Slew rate of op-amp

(b) State the Barkhausen condition for an electronic system to oscillate with feedback.

(c) Explain the circuit diagram of lead-lag compensator using op-amp.

7. Attempt any *two* of the following : 7×2=14

(a) Draw circuit diagram of an RC phase shift oscillator and obtain an expression for its frequency of oscillation.

(b) Draw circuit diagram of instrumentation amplifier and obtain an expression of voltage gain.

(c) With neat circuit diagram, generate square-wave form.

8. Attempt any *two* of the following : 7×2=14

(a) With $g_m = 50$ mA / V, $r_{be} = 1$ kΩ, $C_e = 1$ pf, $C_c = 0 \cdot 2$ pf, determine the values of f_β and f_T.

(b) Prove the following :

$$f_H = \frac{g_m + g_{be}}{2\pi(C_L + C_e)}$$

Where C_L = load capacitor.

(c) With a neat diagram, explain construction of *n*-channel of JFET and also draw its characteristics.

9. Attempt any *two* of the following : 7×2=14

(a) Describe Miller effect and derive an equation for Miller input and output capacitor.

(b) With suitable diagram, explain *P-N* junction diode and also draw its *I-V* characteristics.

(c) Explain positive clipping and negative clamping circuits.

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