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May 2007

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J-6018[S-507/18] **[2957]**

B.Tech. (Semester - 3rd)

ELECTRONIC DEVICES AND CIRCUITS (EC - 201)

Time : 03 Hours **Maximum Marks : 60**

Instruction to Candidates:

1) Section - A is **Compulsory**.
2) Attempt any **Four** questions from Section - B.
3) Attempt any **Two** questions from Section - C.

Section - A

Q1) *(10 x 2 = 20)*

a) What is the relation between the transition capacitance and reverse bias voltage in a p-n diode?

b) A BJT with $\beta = 49$ and $I_{CO} = I_{CBO} = 1\mu$ A and $I_B = 10\mu$ A. Calculate I_C?

c) Why CE configuration is preferred for cascaded amplifiers?

d) What is thermal runaway?

e) What are the requirements of a good biasing circuit?

f) What are the advantages of voltage series feedback topology?

g) Compare the performance of FET with MOSFET.

h) State the working principle of a photodiode.

i) Explain harmonic distortion in amplifiers.

j) Why it is advisable to express amplifier gain in dB.

Section - B

(4 x 5 = 20)

Q2) Draw the practical circuit of complementary symmetry push-pull amplifier and explain its working.

Q3) In the fixed-bias circuit of a transistor, $V_{CC} = 15$V, $R_B = 300$ kΩ, $R_L = 2$ kΩ. If $\beta = 100$, $I_{CO} = 20$ nA and $V_{BE} = 0.7$V. Find the stability factor of Q-point with respect I_{CO}.

Q4) Explain how an FET is used as a VVR.

P.T.O.

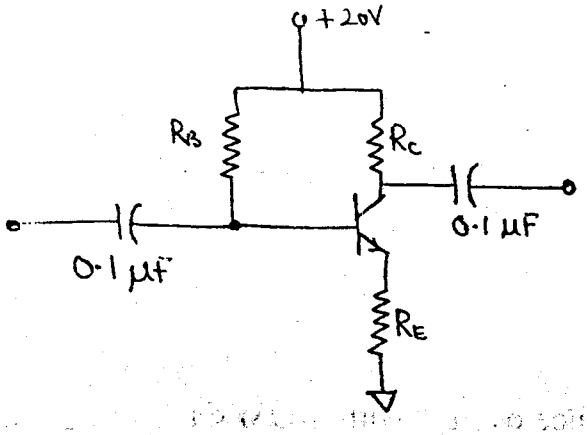
Q5) Draw two stages of RC-coupled, direct-coupled and transformer-coupled amplifiers and make a chart showing the comparison of three coupling schemes.

Q6) The open-loop gain of an amplifier is -200. A voltage series negative feedback is used with a feedback ratio of -0.02. The input and output impedances of the amplifier are 2kΩ and 40kΩ respectively in the absence of feedback. Determine the closed-loop gain, input and output impedances when the feedback circuit is completed.

Section - C

(2 x 10 = 20)

Q7) In a small-signal amplifier shown below, h_{fe} = 100, h_{ie} = 560 Ω, R_C= 2 kΩ, R_E = 1 kΩ, R_B= 600 kΩ, h_{re} and h_{oe} are negligible.



(a) Draw the h-parameter equivalent circuit for the amplifier. Calculate the input and output impedances and the voltage gain.

(b) Give the DC load line of the circuit and find Q-point.

Q8) (a) Draw the circuit of Wein bridge oscillator using op-amps. Explain its working principle. What is its frequency of oscillations and β requirement?

(b) A certain Colpitt oscillator uses a tank circuit with L = 20 mH, C1 = 200 pF and C2 = 300 pF. Calculate the frequency of oscillations.

Q9) (a) Draw the block diagram of regulated power supply and explain the role of each block.

(b) Draw the circuit of a Class-A direct-coupled power amplifier. Show that the dissipation in the transistor is maximum under quiescent conditions. Obtain the expression for maximum efficiency of the circuit.