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3 (Sem-3/CBCS) ELE HC 1

2021

(Held in 2022)

ELECTRONICS

(Honours)

Paper : ELE-HC-3016

(Electronic Circuits)

Full Marks : 60

Time : Three hours

**The figures in the margin indicate
full marks for the questions.**

1. Choose the correct option : $1 \times 7 = 7$

(a) Efficiency of a half-wave rectifier is

(i) 20%

(ii) 30%

(iii) 50%

(iv) None of the above

Contd.

- (b) Bandwidth of an amplifier reduces with
- (i) decrease of voltage gain
 - (ii) increase of negative feedback
 - (iii) increase in bandwidth of input signal
 - (iv) None of the above
- (c) Knee voltage of germanium p-n junction diode is about
- (i) 0.1 V
 - (ii) 0.3 V
 - (iii) 0.7 V
 - (iv) None of the above
- (d) Crossover distortion of signal occurs in _____ power amplifier.
- (i) Class A
 - (ii) Class B push-pull
 - (iii) Class C
 - (iv) Class D

- (e) Degenerative feedback of RC-coupled MOSFET amplifier can be reduced by
- (i) applying a small amount of positive feedback
 - (ii) increasing voltage gain of the circuit
 - (iii) connecting a bypass capacitor across the biasing resistor of the source terminal
 - (iv) None of the above
- (f) MOSFET is a voltage-controlled device since its collector current
- (i) depends on source current only
 - (ii) depends on source voltage only
 - (iii) does not depend on gate current
 - (iv) None of the above
- (g) Which one has steeper roll-off ?
- (i) First-order low-pass filter
 - (ii) Second-order high-pass filter
 - (iii) Third-order low-pass filter
 - (iv) None of the above

2. Answer the following questions in brief :

2×4=8

(i) Draw small signal AC equivalent circuit of BJT by using h -parameter in common emitter mode.

(ii) Label the important frequency bands of a band-pass filter's magnitude response curve.

(iii) Draw circuit diagram of phase-shift oscillator designed with BJT or MOSFET.

(iv) Write the mathematical expressions of voltage gain for an RC-coupled BJT amplifier with and without bypass capacitor across emitter biasing resistor.

3. Answer **any three** of the following questions : 5×3=15

(a) Distinguish between half-wave and full-wave rectifiers.

(b) Explain the working of Zener diode and BJT-based DC voltage regulator circuit.

(c) Derive the expression for efficiency of Class B power amplifier.

(d) The operating point of a BJT is (5 V, 1 mA) in a fixed current biased amplifier circuit. Determine the values of biasing resistors R_b and R_c if the BJT has common emitter current gain (beta) $\beta = 60$. Neglect the leakage current.

(e) Two Zener diodes having breakdown voltage of 5 V are connected in series with a current limiting resistor. The circuit draws 10 mA of current from a 15 V DC power supply in reverse bias. Determine the value of current limiting resistor. Also, find the voltage drop across the resistor too.

4. Answer **any three** of the following questions : 10×3=30

- (i) Derive the mathematical expression for RMS and average values of current for a half-wave rectifier.
- (ii) Draw the circuit diagram of double stage transformer-coupled BJT amplifier and explain its working in detail.
- (iii) Explain the types of distortions found in power amplifier output. Explain the advantages and disadvantages of using MOSFET as compared to BJT in the design of amplifier circuits.
- (iv) Describe the working of BJT-based Hartley oscillator circuit.

- (v) Describe the frequency response of RC-coupled BJT amplifier in detail.
 - (vi) With a mathematical derivation, show that negative feedback reduces noise and distortion of an amplifier.
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