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5 SEM TDC PHY M 4

2017

(November)

PHYSICS

(Major)

Course : 504

(Electronics)

Full Marks : 60
Pass Marks : 24/18

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Choose the correct answer : 1×6=6

(a) The frequency of ripple voltage at the output of a full-wave rectifier operating from a 50 Hz supply is

(i) 50 Hz

(ii) 100 Hz

(iii) 150 Hz

(iv) 200 Hz

(Turn Over)

(b) A semiconductor is formed by

(i) ionic bond

(ii) electrovalent bond

(iii) covalent bond

(iv) coordinate bond

(c) The voltage gain of a transistor is highest in the configuration

(i) CB

(ii) CC

(iii) CE

(iv) emitter follower

(d) The CMRR is defined as the ratio of

(i) differential voltage gain to current gain

(ii) current gain to differential voltage gain

(iii) differential voltage gain to common-mode voltage gain

(iv) None of the above

(Continued)

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(e) The oscillator which produces non-sinusoidal waveform is

(i) tuned collector

(ii) Hartley oscillator

(iii) relaxation oscillator

(iv) crystal oscillator

(f) The minimum number of NOR gates required to design an XOR gate is

(i) 3

(ii) 4

(iii) 5

(iv) 7

2. Answer the following questions : 2×6=12

(a) A diode having forward resistance of 50 Ω supplies power to a load resistance 1200 Ω from a 20 V (r.m.s.) source. Calculate d.c. load current.

(b) Explain the difference between a semiconductor and conductor from band diagram.

(Turn Over)

(c) What is thermal stabilization?

(d) An amplifier has a voltage gain of −100. The feedback ratio is −0·04. Find the voltage gain with feedback.

(e) State Barkhausen criterion for sustained oscillation.

(f) Draw the logic circuit of the following Boolean equation :

$$W = (X + YZ)(Y + \bar{Z}X)$$

3. (a) Distinguish between Zener diode and ordinary junction diode. Explain the action of Zener diode as voltage regulator. Draw the *V-I* characteristics of Zener diode and explain it. 2+3+2=7

(b) Differentiate intrinsic and extrinsic semiconductor on the basis of energy-band diagram. Explain the mechanism of current flow under forward and reverse biased conditions. 3+4=7

Or

Draw the circuit diagram of a bridge rectifier with shunt capacitor filter and explain its operation. Derive the expression for ripple factor and efficiency without filter. 3+4=7

(Continued)

4. (a) Find the gain of negative feedback amplifier with block diagram. Discuss the effect of negative feedback on amplifier characteristics. 3+4=7

Or

What are class-A and class-B amplifier? Draw the circuit diagram of a push-pull class-B transistor amplifier and explain its operation. Find an expression for the maximum efficiency of the amplifier. 2+5=7

(b) Explain the mechanism of current flow in a *p-n-p* transistor. 3

5. (a) Explain how an OP-AMP can be used as integrator. 3

(b) Draw the circuit diagram of Hartley oscillator and explain its operation. Find the expression for frequency of oscillation. 2½+2½=5

Or

What is an IC? Explain the steps involved in fabricating a diode in an IC. Write the limitation of IC. 1+3+1=5

(Turn Over)

6. *(a)* Realize an OR gate using *p-n* diode and explain its operation.

(b) Simplify the following Boolean expression :

$$\overline{(\overline{AC}+B)}(\overline{\overline{A}+\overline{C}})$$

(c) Discuss the working of half adder with its logic diagram and truth table.

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