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Total number of printed pages–7

3 TDC (Special) PHY M 2

2016

(July)

PHYSICS

(Major)

Paper : 30200

(Electronics)

Full Marks : 67

Time : Three hours

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

1. Choose the correct answer : 1×7=7

(a) Rectification efficiency of a full-wave rectifier without filter is nearly equal to

(i) 51%

(ii) 61%

(iii) 71%

(iv) 81%

Contd.

(b) When the temperature of a doped semiconductor is increased, its conductivity

(i) increases

(ii) decreases

(iii) does not change

(iv) increases or decreases depending upon type of semiconductor

(c) The main component responsible for lowering of gain in an *R-C* coupled amplifier in low frequency range is

(i) biasing system

(ii) coupling resistor R_E

(iii) coupling capacitor C_E

(iv) power supply

(d) The common collector amplifier is known as

(i) base follower

(ii) emitter follower

(iii) source follower

(iv) collector follower

(e) The feedback factor β at the frequency of oscillation of a Wien bridge oscillator is

(i) 3

(ii) $\frac{1}{3}$

(iii) $\frac{1}{29}$

(iv) $\frac{3}{29}$

(f) The slew rate of an operational amplifier indicates how fast its output

(i) current can change

(ii) impedance can change

(iii) power can change

(iv) voltage can change

when a step input is given.

(g) Which of the following Boolean rules is correct ?

(i) $A + 0 = 0$

(ii) $A + 1 = 1$

(iii) $A + \overline{A} = A\overline{A}$

(iv) $A + AB = \overline{A} + B$

2. (a) Distinguish between Zener and avalanche breakdown in *p-n* junction diode. 2

(b) Draw the load voltage waveform for a half-wave and full-wave rectifier with a capacitor filter. 2

(c) What is amplitude distortion ? 2

(d) In an amplifier with negative feedback, the gain of the basic amplifier is 100 and it employs a feedback factor 0·02. If the input signal is 40 *mV*, calculate the output voltage of the amplifier with feedback. 2

(e) Write the advantages of crystal oscillator. 2

(f) What are the advantages and disadvantages of IC technology ? 2

(g) State de Morgan's theorem. 2

3. Draw the circuit diagram of a half-wave rectifier and calculate its ripple factor and efficiency. Discuss the function of shunt capacitor filter connected at the output of the rectifier with waveform. 1+2+2+3=8

Or

What is *p-n* junction ? Why a potential difference develops across an open circuited *p-n* junction ? Describe the mechanism of rectification at a *p-n* junction and mention the factors determining the reverse current in such a rectifier. 1+3+4=8

4. What is transistor biasing ? Discuss the working of voltage divider method of transistor biasing in detail and find the expression for stability factor. What are the basic conditions which are to be necessarily fulfilled for achieving faithful amplification of input signal in transistor amplifier ? 1+4+3=8

Or

Find the expression for gain of a negative feedback amplifier with the help of block diagram. Discuss the effect of negative feedback on amplifier characteristics. 4+4=8

5. (a) What is the condition for sustained oscillation ? Draw the circuit diagram of Hartley oscillator and explain its operation. Find the expression for frequency of oscillation. 2+3+3=8

(b) A tuned-collector oscillator employs a transformer, whose primary inductance is 10 *mH*. The capacitor connected across the primary has a capacitance of 100 *pF*. Find the frequency of oscillation. 2

6. (a) Discuss briefly the steps involved in fabricating a transistor in an IC. 4

(b) Explain the working of an operational amplifier as differentiator and integrator. 4

(c) What is CMRR of an operational amplifier ? 2

7. (a) Simplify using Boolean algebra

$Z = AB + A(B + C) + B(B + C)$ 2

(b) Obtain the truth table for the logic expression $Z = \overline{A}B + A\overline{B}$ and realise the operation using AND, OR and NOT gates. 2+2=4

(c) Draw the logic diagram of a full adder and explain its operation. 4
