

2020
PHYSICS
[HONOURS]
Paper : XI
[PRACTICAL]

Full Marks : 80

Time : 6 Hours

Answer any **eight** questions: 10×8=80

1.
 - a) Draw the circuit diagram to draw the I-V characteristics of a valve diode. Write down some applications of valve diode.
 - b) What are the laws of thermionic emission?
 - c) What is “space-charge effect”?
 - d) What are the pros and cons of a valve diode in comparison with semiconductor diode?
 - e) Do you know any other type of electron emission other than thermionic emission?
(2+2+2+2+2)
2.
 - a) Draw the circuit diagram to draw the I-V characteristics of a p-n junction diode.
 - b) Draw the I-V characteristic of p-n junction diode for forward bias showing cut-in voltage.
 - c) What do you mean by majority carrier and minority carrier?
 - d) Explain how a diode can be used as a half wave rectifier?
 - e) Define band-gap. (2+2+2+2+2)
3.
 - a) Draw the I-V characteristic of a Zener diode for revers bias.
 - b) What is the difference between avalanche breakdown and Zener breakdown?
 - c) Why a resistance is always connected in series with a Zener diode?
 - d) On what factors does the breakdown voltage depend on?
 - e) Explain how a Zener diode can be used to regulate voltage. (2+2+2+2+2)
4.
 - a) What is a transistor? How many types of transistor do you know?
 - b) What are CE, CB and CC configuration of a transistor? Out of these which configuration is commonly used in amplifiers and why?

[Turn over]

- c) Draw the input and output characteristics in CE configuration.
- d) Define α and β of a transistor. Establish the relation between them. (2+2+2+4)
5. a) Define hybrid parameters for bipolar junction transistors. Are there any parameters other than h -parameters?
- b) Draw a circuit diagram to measure h_{fe} and h_{ie} .
- c) What is biasing of a transistor and why is it so important?
- d) What are the Q points and load line of a transistor? (3+2+2+3)
6. a) What are class A, B C and AB amplifiers?
- b) Draw the circuit diagram for a CE amplifier.
- c) Define decibels (dB). Express power gain $A_p = 10$ in dB.
- d) Define bandwidth. How does the gain-bandwidth product of a CE amplifier vary?
- e) What is Darlington pair? When is it used? (2+2+2+2+2)
7. a) What are the properties of an *ideal* OPAMP?
- b) Explain how an OPAMP can be used as an inverting amplifier? Why it is called inverting amplifier?
- c) What do you mean by negative feedback and virtual grounding?
- d) Define CMRR and slew rate.
- e) Draw a circuit diagram to generate square wave using OPAMP. (2+2+2+2+2)
8. a) What are truth tables? Write down the truth table for a XOR and XNOR gate.
- b) What do you mean by DL, TTL, DTL and CMOS logic?
- c) Write down De-Morgan's theorems.
- d) Which are the universal gates? Construct all basic gates using any one of the universal gate.
- e) What is the difference between a sequential logic circuit and a combinational logic circuit? (2+2+2+2+2)
9. a) Draw the circuit diagram to measure capacitance by Wein's bridge. What will happen if the positions of the audio source and ac null detector are altered?

- b) What is the difference between resistance and impedance?
 - c) Define power factor. What is the power factor of an ideal capacitor?
 - d) Why do we need to balance “dc” as well as “ac” in ac bridges?
 - e) Do you know any other method of measuring capacitance? (2+2+3+2+1)
10. a) Draw the circuit diagram to measure the mutual inductance of two coaxial coils and identify each component of the apparatus.
- b) What is a ballistic galvanometer? What do you mean by critical damping resistance of a ballistic galvanometer?
 - c) Define coefficient of mutual inductance? What is its unit?
 - d) Can the mutual inductance between two coils be same as the self-inductance of either coil?
 - e) Give some examples of the applications of the principle of mutual inductance. (2+2+2+2+2)
