B.Sc./4th Sem (H)/PHYS/24(CBCS)

2024

4th Semester Examination

PHYSICS (Honours)

Paper : C 10-T

[Analog Systems and Applications]

[CBCS]

Full Marks : 40 Time : Two Hours

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Group - A

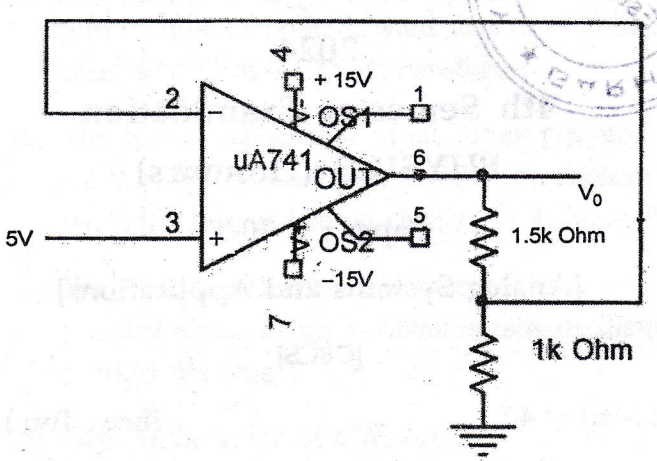
Answer any ***five*** questions. 2×5=10

1. How can η be determined from the logarithmic characteristic of *p-n* junction diode?

2. What peak inverse voltage (PIV) rating is required for the diodes in a bridge rectifier that produces an average output voltage of 50V? Assume diode cut in voltage = 0.7V.

P.T.O.

3. Determine the output voltage of the following circuit.



4. How does tunnel diode work?

5. Determine h_{ie}, h_{fe} from transistor characteristics curve.

6. What is the slew rate of OPAMP?

7. Explain the use of photodiode as a voltage cell.

8. How does the tank circuit work in an oscillator?

Group - B

Answer any ***four*** questions. 5×4=20

9. Explain the operation of bridge rectifier with the help of necessary circuit diagram. The output voltage across the load resistance of an inductor filter connected to a bridge rectifier shows a dc value of 20V and a peak to peak ripple voltage of 1V. Calculate the ripple factor. 4+1

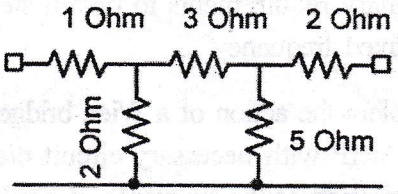
10. What is the use of unit gain buffer circuit with op-amp?

Setup an analog computer using op-amp to solve the following simultaneous equations.

$$5x+2y=12$$
$$3y-2x=6$$ 1+4

11. (a) What are the necessity of *h* parameters?

(b) Find the values of h parameters of the given circuit.



3+2

12. How can the Zener diode be used as a voltage regulator? What is the difference between the photodiode and solar cell? 3+2

13. What do you mean transistor stability? Show that emitter bias circuit is most stable circuit. 1+4

14. Write down the principle of operation in R-2R ladded network to convert digital to analog input? 5

Group - C

Answer any ***one*** question. 10×1=10

15. (a) Determine the potential barrier height of an unbiased pn junction.

(b) Draw the current-voltage characteristics curve of a pn-junction in both forward and reverse-biased conditions from the Diode equation.

(c) The barrier capacitance of an abrupt p-n junction diode is 4pF at 4V. Find the change in capacitance when the reverse biasing changes to 4.5V. 4+3+3

16. (a) What are the Barkhausen criteria? What are the primary requirements to obtain steady oscillations at fixed frequency?

(b) Explain the action of a Wien bridge oscillator using OPAMP with necessary circuit diagram. Find the expression of the frequency of oscillation and prove that the gain of the amplifier used in a Wien-bridge oscillator must be greater than 3 for sustain oscillation. 3+(4+3)
