2025/FYUG/EVEN/SEM/
PHYDSC–252/045

FYUG Even Semester Exam., 2025

PHYSICS

(4th Semester)

Course No. : PHYDSC–252

(Electronics)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *two* of the following questions : 2×2=4

(a) Define conductivity and mobility.

(b) Define static and dynamic resistance of a *p-n* junction.

(c) Explain the principle of LED.

2. Answer *either* [*(a)* & *(b)*] *or* [*(c)* & *(d)*] : 10

(a) Explain in detail both forward and reverse bias characteristics of a *p-n* junction diode with necessary diagram. Why is the current that flows during reverse bias condition across a *p-n* junction diode called reverse saturation current? 4+1=5

(b) Draw the circuit diagram of a full-wave rectifier. Find the expression of efficiency and ripple factor of a centre-tap full-wave rectifier. 1+4=5

(c) Distinguish between Zener breakdown and Avalanche breakdown. 3

(d) When do we consider a Zener diode to be in ON state and when do we consider to be in OFF state? Explain the working of a Zener diode as voltage regulator with necessary circuit diagram. 2+5=7

UNIT—II

3. Answer any *two* of the following questions : 2×2=4

(a) Why is a transistor also called BJT?

(b) Why is base of a transistor made extremely thin?

(c) Define α. Show that it is less than unity.

4. Answer *either* [*(a)* & *(b)*] *or* [*(c)* & *(d)*] : 10

(a) Draw the circuit diagram for plotting the input and output characteristics of a transistor in CE mode. Also explain the input and output characteristics of transistor in CE mode. 2+4=6

(b) Explain the importance of *Q*-point. Also mention why it needs to be stabilized. 4

(c) Explain the method of voltage divider biasing in detail with necessary circuit diagram and hence find the expression of stability factor. 6

(d) In a CB configuration, the emitter current is 1 mA. If the emitter side is open, the collector current becomes 60 μA. Find the value of total collector current I_c, if $\alpha = 0{\cdot}9$. 4

UNIT—III

5. Answer any *two* of the following questions : 2×2=4

(a) Why are *h*-parameters called hybrid parameters?

(b) Explain the difference between virtual ground and real ground.

(c) What is slew rate? What causes it?

6. Answer *either* [*(a)* & *(b)*] *or* [*(c)* & *(d)*] : 10

(a) Explain how *L-C* oscillations are produced. Write down the condition for sustained oscillation. 3+1=4

(b) Explain the working of an *R-C* phase shift oscillator in detail with necessary circuit diagram. Also mention the expression of its frequency of oscillation. 5+1=6

(c) For a *C-E* transistor amplifier, find the expression of current gain, voltage gain, power gain using *h*-parameter. Also draw the *h*-parameter equivalent circuit for *C-E* amplifier. 5+2=7

(d) Explain how OP-AMP can be used to work as an integrator. 3

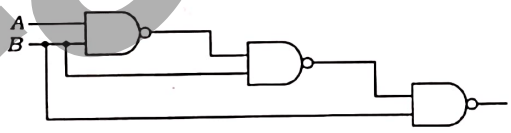
UNIT—IV

7. Answer any *two* of the following as directed : 2×2=4

(a) Convert $(100)_{10}$ to binary.

(b) Illustrate the difference between SOP and CSOP with example.

(c) For which binary values of *A* and *B*, the output of the following circuit will be zero?



(i) $A = 0,\ B = 0$

(ii) $A = 0,\ B = 1$

(iii) $A = 1,\ B = 0$

(iv) $A = 1,\ B = 1$

(Choose the correct answer)

8. Answer *either* [*(a)* & *(b)*] *or* [*(c)* & *(d)*] : 10

(a) Prove the identity

$$AB + \overline{AC} + A\overline{B}C(AB + C) = 1$$ 4

(b) Sketch a basic AND circuit with two diodes. Explain the operation of the circuit and hence find its truth table. 6

(c) For three variables *A*, *B*, *C*, list all the possible values of maxterms and minterms mentioning the symbol (designation) and representing terms corresponding each combination. 5

(d) What do you mean by cell adjacency in the context of k-map? For the given truth table, draw the k-map and hence find the simplified expression : 1+4=5

A	B	C	Y
0	0	0	0
0	0	1	1
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

UNIT—V

9. Answer any *two* of the following questions : 2×2=4

(a) Add $(110011)_2$ and $(101101)_2$.

(b) Subtract $(1101)_2$ from $(1010)_2$ using 1's complement method.

(c) Mention two practical uses of demultiplexer.

10. Answer *either* [(a) & (b)] *or* [(c) & (d)] : 10

(a) Explain the working of a full adder in detail with necessary circuit diagram and truth table. 4

(b) Discuss the working of a J-K flip-flop with necessary logic circuit diagram and truth table. Also explain race around condition. 4+2=6

(c) What is the difference between arithmetic circuit and sequential circuit? Explain how one can realize full adder using half adder. 1+4=5

(d) Explain the working of a 4×1 MUX in detail with necessary circuit diagram and truth table. 5

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