

BACHELOR OF SCIENCE EXAMINATION, 2019

(2nd Year, 2nd Semester, Old Syllabus)

PHYSICS (SUBSIDIARY)

Paper : SO-8

Time : Two hours

Full Marks : 50

The figures in the margin indicate full marks.

Answer any *four* questions.

1. (a) Convert the decimal number 17.375 to its binary equivalent and the binary number 11.1101 to its decimal equivalent.

(b) Add the binary numbers 1001 and 110.

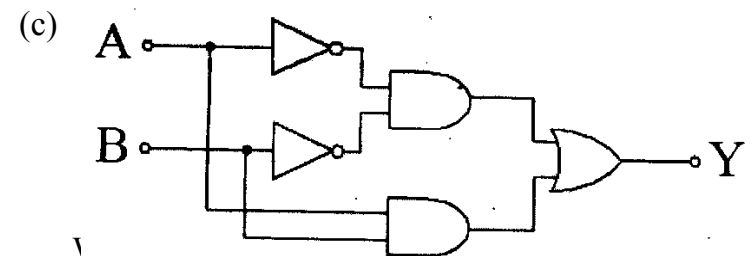
(c) Prove the Boolean identity $\overline{A \cdot B} = \overline{A} + \overline{B}$

(d) Simplify the expression $\overline{\overline{A} \cdot B} + \overline{A} + \overline{A \cdot B}$

4+2¹/₂+4+2

2. (a) Design an AND gate with the help of diodes.

(b) Show that NOR gate is an universal gate.



(Turn Over)

(2)

- (d) Define low pass and high pass filter. $3+3+3+3\frac{1}{2}$
3. (a) State the characteristics of an ideal OP-AMP.
(b) Explain the concept of virtual ground in an OP-AMP.
(c) Draw the circuit diagram of an inverting amplifier using an OP-AMP and find out an expression for the voltage gain of this amplifier.
(d) In an OP-AMP inverting amplifier, the input and feedback resistances are $10\text{ K}\Omega$ and $50\text{ K}\Omega$, respectively. If the input voltage is 1.0 V , find out the output voltage. $2\frac{1}{2}+2+5+3$
4. (a) How the depletion region is formed in p-n junction? Explain the variation of its width with biasing.
(b) Show that a full-wave rectifier is more efficient than a half-wave rectifier.
(c) Explain how a Zener diode maintains a constant voltage across a load. $4+5\frac{1}{2}+3$
5. (a) Draw the circuit diagram of a transistor operating in a common base configuration and sketch its input and output characteristic curves indicating different regions.
(b) Find out its expression for voltage gain in terms of current gain, input resistance and the load resistance.

(3)

- (c) The constant α of a transistor is 0.95 . What would be the change in the collector current corresponding to a change of 0.4 mA in the base current in common emitter amplifier? $5+4+3\frac{1}{2}$
6. (a) Explain with the help of a block diagram the working principle of feedback amplifier. What are the advantages of negative feedback?
(b) What kind of feedback is used in oscillator circuit? Explain the basic criterion to be fulfilled in the feedback circuit for the oscillation to sustain.
(c) The voltage gain of a transistor amplifier is 50 . If the amplifier is provided with 10% negative feedback, calculate its voltage gain. $4+1\frac{1}{2}+4+4$

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