

BACHELOR OF SCIENCE EXAMINATION, 2018

(2nd Year, 2nd Semester)

PHYSICS (Subsidiary)

Paper-SO8

Time: Two hours**Full Marks: 50**

The figures in the margin indicate full marks

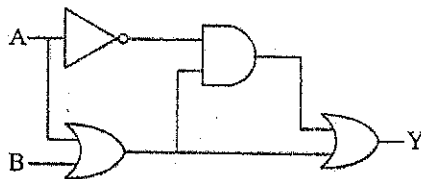
Answer any **four** questions

1. a) Convert the decimal number 29.625 to its binary equivalent and the binary number 101.011 to its decimal equivalent.
- b) Add the binary numbers 1110 and 101.
- c) State and prove De Morgan's theorems.

$$4 + 2 + 6\frac{1}{2} = 12\frac{1}{2}$$

2. a) Draw a XOR gate and write the truth table.
- b) Show that NAND gate is a universal gate.

c)



Write down the expression for Y.

- d) Simplify the expression $\overline{(A + \bar{B} + C) + (B + \bar{C})}$

$$3 + 3 + 4 + 2\frac{1}{2} = 12\frac{1}{2}$$

3. a) What are extrinsic semiconductors? How can they be formed?
- b) Discuss how a semiconductor diode can be used as a rectifier. Distinguish between half wave and full wave rectifier.
- c) What is Ripple Factor? How can you decrease Ripple Factor by using a C filter?

$$4 + 5 + 3\frac{1}{2} = 12\frac{1}{2}$$

4. a) A transistor has a collector current of 5 mA and a base current of $20\mu\text{A}$. Find the value of α ?
- b) Draw the circuit diagram of a transistor operating in a common emitter configuration and sketch its input and output characteristic curves indicating different regions.
- c) In a transistor working in C-E mode, the p.d. across a load of 800Ω in the collector circuit is 0.5 volt. If $\alpha=0.96$, find the base current.

$$2 + 6\frac{1}{2} + 4 = 12\frac{1}{2}$$

5. a) Define α and β of a transistor. Derive the relation between α and β .
- b) Explain the concept of feedback in amplifier. What do you mean by positive and negative feedback?
- c) When negative feedback is applied to an amplifier of gain 100, the overall gain reduces to 50. Find the fraction of output voltage as feedback.

$$4 + 5 + 3\frac{1}{2} = 12\frac{1}{2}$$

6. a) Write down the characteristics of an ideal OP-AMP.
- b) Draw the circuit diagram of a non-inverting amplifier using an OP-AMP and find out the expression for its voltage gain.
- c) Explain the voltage stabilization capabilities of a zener diode through a simple circuit.

$$3\frac{1}{2} + 5 + 4 = 12\frac{1}{2}$$