

TUTORIAL-8

EE 101: Basic Electronics

DEPARTMENT OF ELECTRONICS & ELECTRICAL ENGINEERING

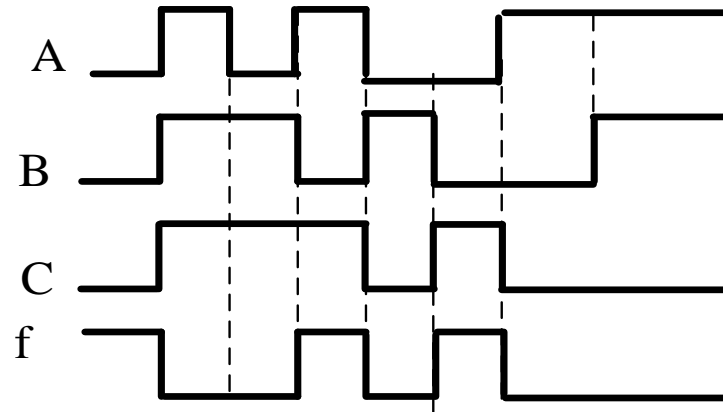
INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI

*(First question is the **Pre-Tutorial Assignment problem** to be solved in the space provided.)*

Name:	Roll No.	Tutorial Group:
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1. The operating conditions (ON=1, OFF=0) of three pumps (x , y , and z) are to be monitored. $x=1$ implies that pump x is ON. It is required that an indicator LED should glow when majority of the pumps fail. Derive the minimal sum of product expression whose output is zero when majority of the pumps fail.

2. Given the timing diagram shown in below Figure. Derive the truth table and develop the sum of products Boolean expression for f . Simplify this expression using the Boolean theorems, and implement the simplified expression using minimum number of two input NAND gates only.



3. A safe has five locks, v , w , x , y , and z , all of which must be unlocked for the safe to open. The keys to the locks are distributed among five executives in the following manner:

A has keys for locks v and x ;

B has keys for locks v and y ;

C has keys for locks w and y ;

D has keys for locks x and z ;

E has keys for locks v and z ;

- Using Boolean expression, determine the minimum number of executive required to open the safe.
- Find all the combinations of executives that can open the safe. Write a Boolean expression $f(A,B,C,D,E)$ which specifies when the safe can be opened as a function of which executives are present.
- Who is the “essential executive” without whom the safe cannot be opened?

4. A 300 V rms three-phase system supplies 1200 W to a balanced Y-connected load at a lagging PF of 0.8. What are the phase impedances?

5. A 3-phase source supplies to an inductive delta connected load. Two wattmeter method is employed to measure the 3-phase power. W_1 is connected across line **A** and **C** and W_2 across line **B** and **C**. An ammeter is connected across line A. Reading of wattmeter $W_1 = 15 \text{ kW}$ and the ammeter reads a current of **30 A**. If the load pf is **0.8**, find

- a. Power measured in wattmeter W_2
- b. Magnitude of line voltage
- c. Load resistance per phase and
- d. Load reactance per phase