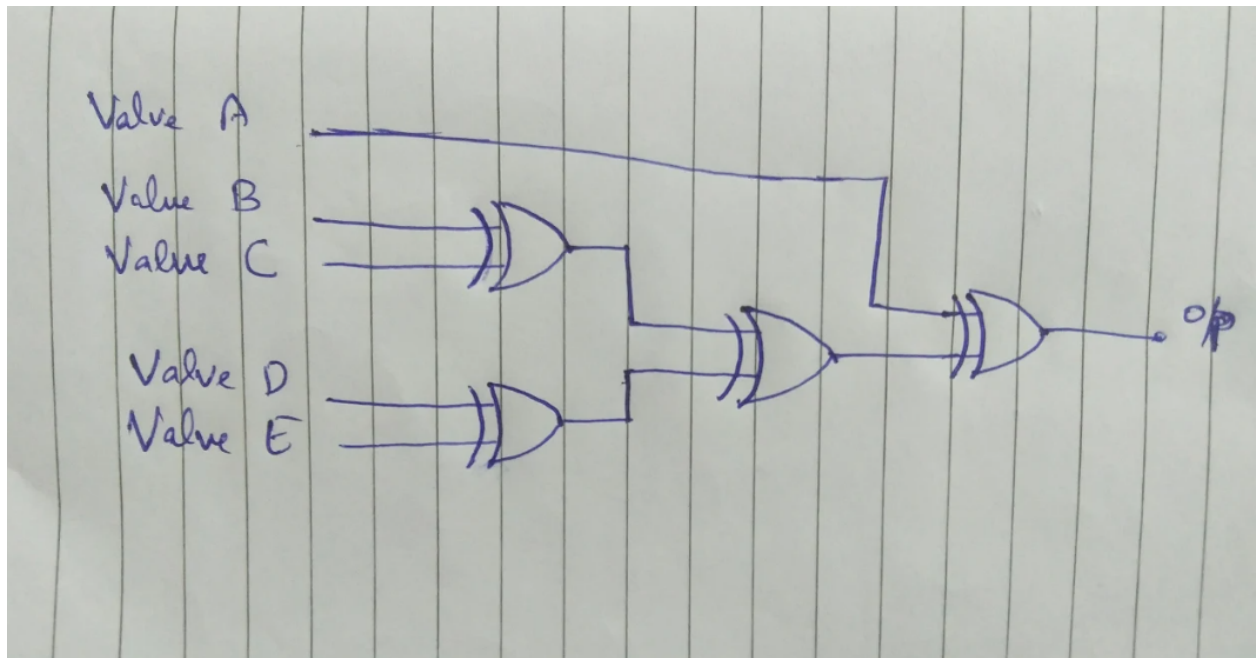


LEVEL-4 ANSWER KEY

ANSWER: 1



ANSWER: 2

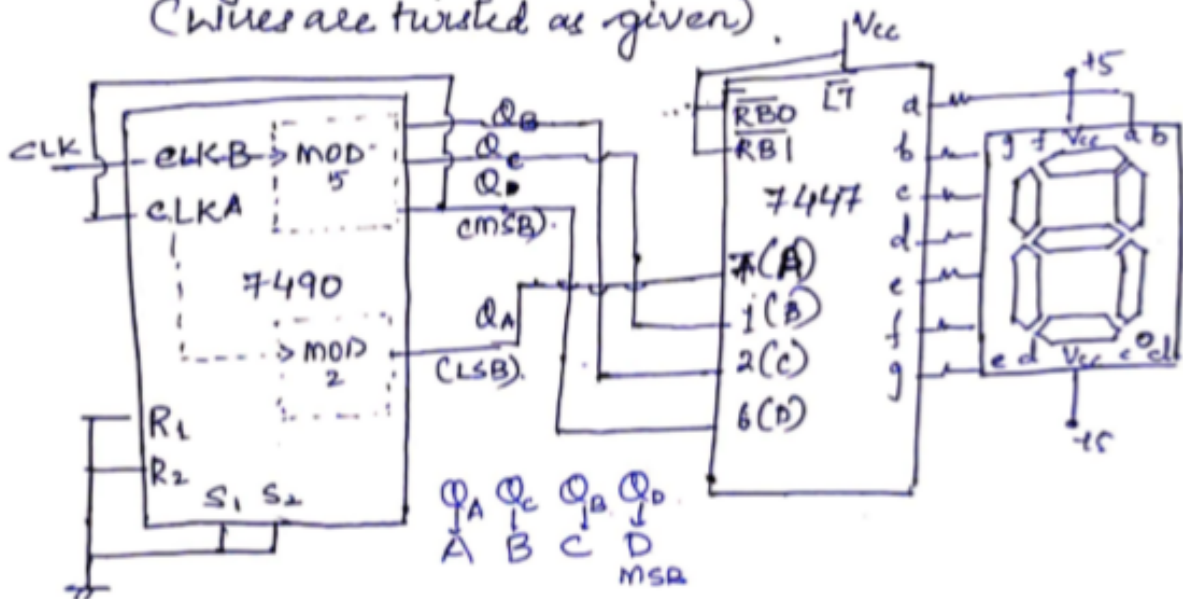
Ans). The question had mentioned of Mod 2 & Mod 5 counter, so the contestants could have used a single IC 7490 to get the required pattern or even using Mod 2 & Mod 5 separately is also good.

Q. The number sequence to be generated is :

A → E → C → G → J → B → F → D → H → I
 0 → 4 → 2 → 6 → 8 → 1 → 5 → 3 → 7 → 9

To get this pattern, give the main clock to Mod 5's clk. Connect the MSB of Mod 5 say Q_D to the up clock of Mod 2 counter. In doing so, you will generate the pattern as 0 → 2 → 4 → 6 → 8 → 1 → 3 → 5 → 7 → 9.

But to get the required pattern, here is the twist. The up of 7 segment display driver should be given as $Q_D Q_B Q_C Q_A$, where Q_D is the MSB. (Wires are twisted as given).



ANSWER: 3

To produce a sine wave at the output, the control signals driving the mosfet drivers (IR2101) must be changed. Currently it is running in fixed PWM mode. (Triangle with a single reference from potentiometer). 50% duty cycle

Change the control signal by applying a 50Hz sine wave $A = 5V_{pp} < 8V_{pp}$ (TRI-wave) with offset = 4V (Triangle has an offset of 4V) to the comparators, Instead of the POT.

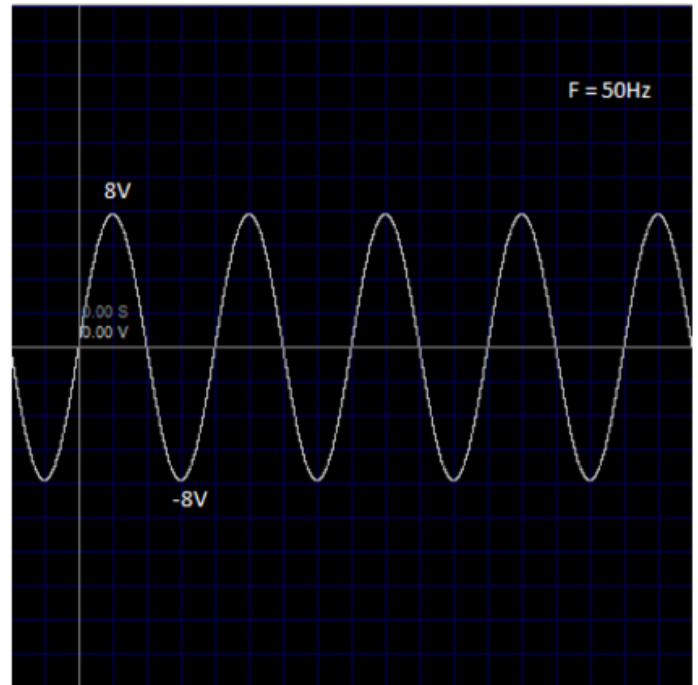
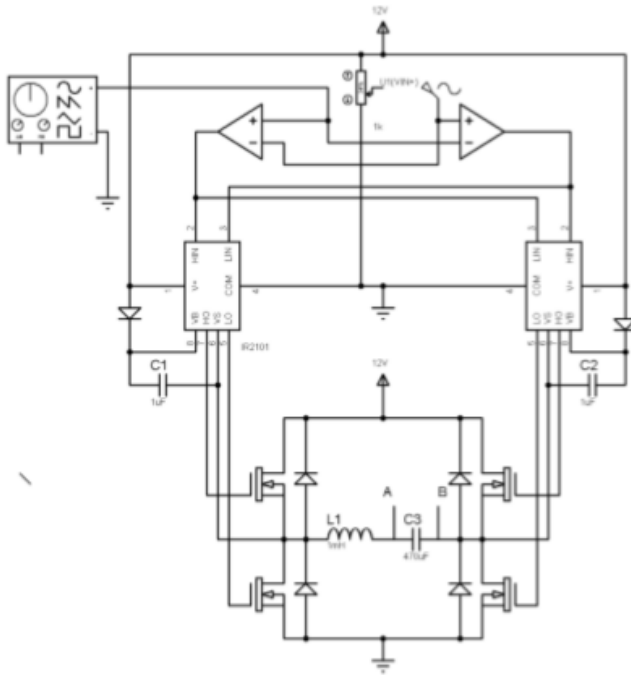
Also the triangle wave frequency must be increased from 50Hz to 5 – 10KHz.

Modified Circuit.

Sine wave, $F = 50\text{Hz}$, $A = 5V_{pp}$

Triangle wave $F = 5\text{-}10\text{KHz}$, $A = 8V_{pp}$

Add a LC low pass filter at the load to get sine wave at the output.



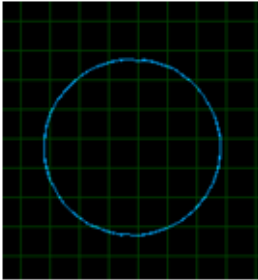
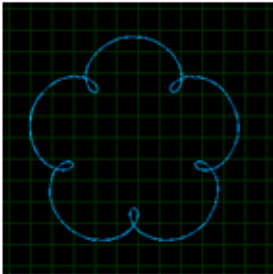
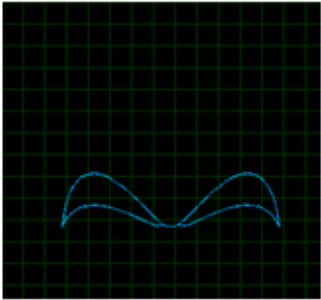
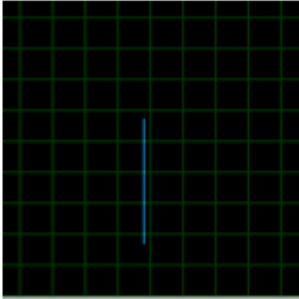
LC low pass with cut off $< 1\text{KHz}$

Add sine wave $f = 50\text{Hz}$, offset = 4V

Increase triangle wave freq 5-10KHz

Add lc low pass filter.

ANSWER: 4

X	Y	Transfer Chara
3V 400Hz Sin Phase Shift=0	3V 400Hz Sin Phase Shift=270	
Wave 1: 4V 400Hz Sin, Phase Shift=0 Wave 2: 1V 2.4KHz Sin, Phase Shift=180	Wave 1: 4V 400Hz Sin, Phase shift=270 Wave 2: 1V 2.4KHz Sin, Phase Shift=90	
5V 400Hz Sin, Phase Shift=0	Wave 1: 1.5V 800Hz Sin, Phase shift=180 Wave 2: 3V 800Hz Sin, Phase shift=0	
Ground	2V 800Hz Sin, Phase shift=0	

The above wave forms are generated and multiplexed using 4051 mux at 200Hz

