Instructions:

1. Attempt any **FIVE** of the following: [10 marks]
   
   (a) Explain why multiplexers are needed in digital electronic system.
   
   (b) With reference to ADC, define accuracy and conversion time.
   
   (c) List the binary, octal and hexadecimal numbers for decimal no. 0 to 15.
   
   (d) Compare between synchronous and asynchronous counter (any two points).
   
   (e) Draw the logical symbol of EX-OR and EX-NOR gate.
   
   (f) Write simple examples of boolean expression for SOP and POS.
   
   (g) Define modulus of a counter. Write the numbers of flip flops required for Mod-6 counter.

2. Attempt any **Three** of the following: [12 marks]
   
   (a) Minimize the following expression using K-Map.
       \[ f(A,B,C,D) = \Sigma m(0,1,2,4,5,7,8,9,10) \]
   
   (b) Convert:
       
       (i) \( (AD92 \cdot BC A)_{16} = (?)_{10} = (?)_8 = (?)_2 \)
   
   (c) Explain the following characteristics w.r.t logic families:
       
       (i) Noise margin
       
       (ii) Power dissipation
       
       (iii) Figure of merit
       
       (iv) Speed of operation
   
   (d) Draw and explain PAL.

3. Attempt any **Three** of the following: [12 marks]
   
   (a) Draw the circuit diagram and draw waveform for ring counter.
   
   (b) Draw the circuit of successive approximation type ADC and explain it's working.
   
   (c) Describe the function of Full Adder Circuit using its truth table, K-Map simplification and logic diagram.
(d) Realize the basic logic gates, NOT, OR and AND gates using NOR gates only.

4. Attempt any Three of the following: [12]
   (a) Subtract the given number using 2’s complement method:
       (i) \( \text{(Number 1) } - \text{(Number 2)} \)
       (ii) \( \text{(Number 1)} - \text{(Number 2)} \)
   (b) State De-Morgan’s theorem and prove any one.
   (c) Design 16:1 mux using 4:1 mux.
   (d) Draw and explain working of 4 bit serial Input parallel Output shift register.
   (e) Calculate analog output of 4 bit DAC for digital input 1101.
       Assume \( V_{FS} = 5V \).

5. Attempt any TWO of the following: [12]
   (a) Design a 4 bit synchronous counter and draw its logic diagram.
   (b) Design mod-3 Asynchronous counter and draw output waveform.
   (c) Design BCD to seven segment decoder using IC 7447 with its truth table.

6. Attempt any TWO of the following: [12]
   (a) Design 4 bit Binary to Gray code converter.
   (b) How can JC 7490 can used as a decade counter with neat block diagram.
   (c) Draw the circuit diagram of 4 bit R-2R ladder DAC and obtain its output voltage expression.

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**S.Y. Diploma Sem-III: Paper Discussion Schedule**

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<td>8 a.m. to 9 a.m.</td>
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<td>6 Nov. 2019</td>
<td>Wednesday</td>
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