

INDIAN INSTITUTE OF TECHNOLOGY DELHI

MAJOR: TXL-771 Electronics and Control

Saturday 4th May 2019

Time: 2 Hour

Total Marks: 30

Note: 1) All questions are compulsory. Bold numbers in brackets indicate maximum marks.

Question 1a: Two parallel conductor carrying current in same direction will each other

- ~~(a)~~ Attract (b) Repel (c) rotate (d) none of all [1]

Question 1b: Which of the control system is most desired [1]

- (a) Under-damped (b) critically-damped (c) over-damped ~~(d)~~ un-damped

Question 1c: Signal to Noise Ratio (SNR) of system when the number of bits [1]

- (a) Increases, increases ~~(b)~~ increases, decreases (c) increase, same (d) none of above

Question 1d: for accurate reproduction of the sampled signal, sampling frequency should be at-least Of the signal frequency. [1]

- (a) 0.5 times ~~(b)~~ equal (c) 2 times (d) does not depends

Question 1e: In signal conditioning module, an amplification stage is generally followed by which of the following stage [1]

- ~~(a)~~ Multiplexer (b) filter (c) ADC (d) sensor

Question 2: What is nyquist criteria? Expain aliasing of the signal. [1+1]

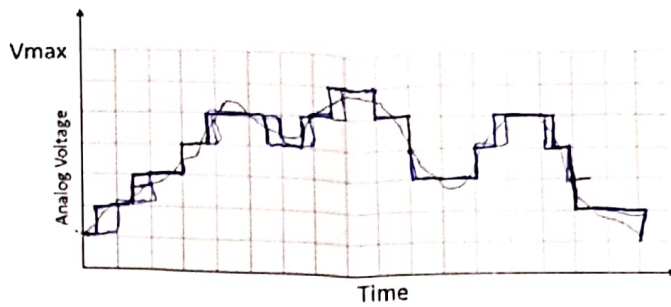
Question 3: Explain the thermal diffusivity based temperature sensor and its working principle. Draw the cross-section and top view of the sensor and explain in detail. [2+1+1]

Question 4: Consider the following second order system?

$$\frac{Y(s)}{U(s)} = \frac{4}{s^2 + 2s + 4}$$

Calculate the peak-time, settling-time and percentage maximum overshoot for the system. [3]

Question 5: Draw the schematic diagram of an 8-bit Flash Analog to Digital Converter (ADC) and explain its working principle. Write the digital output for an analog signal shown in figure below: [4]

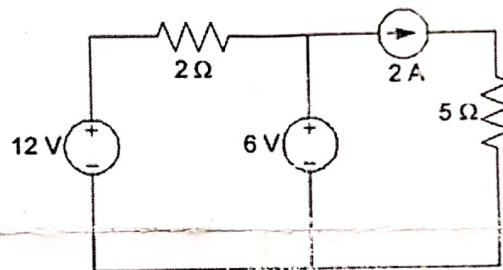


Question 6: Using diagram, explain the working of a 3-phase induction motor.

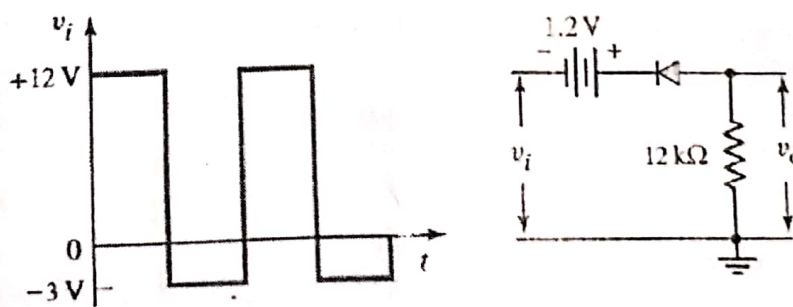
A 208-V, 10hp, four pole, 60 Hz, Y-connected induction motor has a full-load slip of 10 percent

1. What is the synchronous speed of this motor?
 2. What is the rotor speed of this motor at rated load?
 3. What is the rotor frequency of this motor at rated load?
- [3]

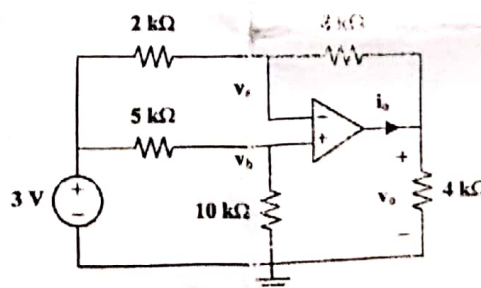
Question 7: Determine the power absorbed by each element in the circuit below: [3]



Question 8: Figure P3.11(a) shows the input voltage of the circuit as shown in Figure P3.11(b). Plot the output voltage V_o of these circuits if $V_t = 0.7$ V [2]



Question 9: Find V_o and I_o in the circuit below: [4]



Handwritten calculations for Question 9:

$V_o = 2$

$V_o = 2$

$V_o = 6$

$\frac{2 - V_o}{8} = \frac{V_o}{4}$

$\frac{1}{2} = \frac{2 - V_o}{8}$

$V_o = 6$