



Q1: Answer using true or false

[25 Marks]

1.	Microcontrollers are used in automatically controlled products and devices, such as automobile engine control systems
2.	A microcontroller (MCU for <i>microcontroller unit</i> , or UC for $\mu$ -controller) is a small computer on a single integrated circuit
3.	Does RPi have an internal memory?
4.	Do Arduino provides IDE Environment?
5.	Does Raspberry Pi need external hardware?
6.	The zero-order hold (ZOH) is a mathematical model of the practical signal reconstruction done by a conventional digital-to-analog converter (DAC). That is, it describes the effect of converting a discrete-time signal to a continuous-time signal by holding each sample value for one sample interval. It has several applications in electrical communication
7.	For FOH, the signal is reconstructed as a piecewise linear approximation to the original signal that was sampled
8.	the Z-transform converts a discrete-time signal which is a sequence of real or complex numbers into a complex frequency-domain representation.
9.	Amplitude modulation (AM) is a modulation technique used in electronic communication, most commonly for transmitting information via a radio carrier wave
10.	if the sampler is used to represent digitally coded data the model will be much simpler
11.	Digital controllers are implemented in a microcontroller (a specialized microprocessor) or a DSP (Digital Signal Processor).
12.	The Analog systems can be used for different applications by simply changing the program without additional changes in hardware.
13.	The cost of hardware gets reduced by use of digital components and this has been possible due to advances in IC technology. With ICs the number of components that can be placed in a given area of Silicon are increased which helps in cost reduction
14.	Analog systems are highly reliable one of the reasons for that is use of error correction codes.
15.	The design of digital systems which require use of Boolean algebra and other digital techniques is easier compared to analog designing.
16.	Since the output of digital systems unlike analog systems is independent of temperature, noise, humidity and other characteristics of components the reproducibility of results is higher in digital systems than in analog systems
17.	A watchdog timer (WDT) is a hardware timer that automatically generates a system reset if the main program neglects to periodically service it
18.	The Capture mode will retrieve a timer value based on a signal event.
19.	The Compare mode will constantly monitor a timer counter value and compare it to a value set in the application. When they match, it will trigger an event.



48.	In the absence of an S/H, the input signal must change by more than one-half of the quantization step during the conversion, which may be an impractical constraint.
49.	Does the level shifter convert the voltage levels between RS-232 and transistor-transistor logic?
50.	Embedded Memory Microcontrollers is a category of microcontrollers acquire the complete hardware configuration on its chip so as to run the particular application
51.	the address and data buses removed in external memory type of microcontrollers Through multiplexing by external latch & DLE signal
52.	Simplicity in Instruction Set is one of the significant designing issues/factors taken into consideration for RISC Processors
53.	compiler optimization is the compact and uniform nature of instructions in RISC processors facilitate to
54.	RISC is a processor has the necessity of manual optimization for the generation of assembly language code especially for the embedded systems
55.	Temporary Register is register of current procedure resemble physically similar to the parameter register of called procedure during register to register operation in an overlapping window of RISC Processors
56.	Harvard architecture is architectural scheme has a provision of two sets for address & data buses between CPU and memory
57.	Rise time is the time taken for response to raise from 0% to 100% for the very first time is rise time.
58.	Frequency Division Multiplexing is a kind of multiplexing scheme is adopted by Von-Newman architecture especially for program and data fetching purposes
59.	The transient response is the response of the system when the system changes from one state to another
60.	Pre-fetching feature deals with the fetching of next instruction during the execution of current instruction irrespective of the memory access

## Q2: Choose the correct answer

[25 Marks]

### 1. How many types of Arduinos do we have?

- a) 5                                      b) 6                                      c) 8                                      d) 6

### 2. What is the microcontroller used in Arduino UNO?

- a) ATmega328p                                      b) ATmega2560  
c) ATmega32114                                      d) AT91SAM3x8E

### 3. What does p refer to in ATmega328p?

- a) Production                                      b) Pico-Power  
c) Power-Pico                                      d) Programmable on chip

### 4. Arduino shields are also called as \_\_\_\_\_

- a) Extra peripherals                                      b) Add on modules  
c) Connectivity modules                                      d) Another Arduinos

### 5. What is the default bootloader of the Arduino UNO?

- a) Optiboot bootloader                                      b) AIR-boot  
c) Bare box                                      d) GAG

### 6. Feedback control systems...

- a) can stabilize an unstable plant.                                      b) can feed sensor noise into the system.  
c) can de-stabilize a stable plant.                                      d) All of the above



20.	The Pulse Width Modulation (PWM) will produce a variable pulse width signal based on a pulse width and period value set in the applications code.
21.	A timer will help to create timing intervals in a system ( <i>like-microcontroller</i> ) so that the user gets the control over his code to perform some time dependent tasks or functions.
22.	A counter is a device that stores (and sometimes displays) the number of times a particular event or process occurred, with respect to a clock signal
23.	The time required to complete the conversion of Analog to Digital is ____ Equals to ____ the duration of the hold mode of S/H.
24.	T and the duration of the sample mode and the hold mode is that it Should be larger than the duration of sample mode and hold mode
25.	Both Timer 1 and Timer 0 in Mode 0 operate as 8-bit counters (with a divide-by-32 prescaler).
26.	The ROC of z-transform of any signal cannot contain poles.
27.	The Harvard architecture was based on the original Harvard Mark I relay-based computer model which employed separate buses for data and instructions.
28.	The term RISC stands for "Reduced Instruction Set Computer". It is a CPU design plan based on simple orders and acts fast
29.	The term CISC stands for "Complex Instruction Set Computer". It is a CPU design plan based on single commands, which are skilled in executing multi-step operations.
30.	A Celsius thermometer is an application for the 8051 microcontrollers.
31.	Erasing or programming a flash memory device is a one-step operation
32.	More than one bit of data can occupy each memory cell
33.	The system is stable if the pole of the z-transform lies inside the unit circle
34.	A typical RAM will write (store data internally) whenever the Chip Select line is active and the Write Enable line is inactive
35.	Is the discrete time LTI system with impulse response $h(n)=a^n(n)$ ( $ a  < 1$ ) BIBO stable?
36.	The z-transform is a conformal mapping from the s-plane to the z-plane by the relation $z = e^{sT}$ .
37.	A multivariable system is a system with more than one input and/or more than one output
38.	The system is stable if the pole of the z-transform lies inside the unit circle
39.	A closed-loop control system uses a measurement of the output and feed-back of the signal to compare it with the desired input.
40.	Final value theorem is used for unstable systems
41.	Speed is one of the most appropriate criterions for choosing the right microcontroller
42.	.txt is the file extension that is loaded in a microcontroller for executing any instruction
43.	The transfer function is the ratio of the Laplace transform of the output variable to the Laplace transform of the input variable, with all initial conditions equal to zero.
44.	the process of down sampling called Fornication
45.	the order decided by a processor or the CPU of a controller to execute an instruction is fetch,decode,execute
46.	A microcontroller at-least should consist of CPU, RAM, ROM, I/O devices, serial and parallel ports and timers
47.	Unlike microprocessors, microcontrollers make use of batteries because they have high power dissipation



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34. The z-transform of a sequence  $x(n)$  which is given as  $X(z) = \sum_{n=-\infty}^{\infty} x(n)z^{-n}$ , is known as:
- Uni-lateral Z-transform
  - Bi-lateral Z-transform
  - Tri-lateral Z-transform
  - None of the mentioned
35. What is the ROC of the system function  $H(z)$  if the discrete time LTI system is BIBO stable?
- Entire z-plane, except at  $z=0$
  - Entire z-plane, except at  $z=\infty$
  - Contain unit circle
  - None of the mentioned
36. Which of these has tendency to oscillate?
- Open loop system
  - Closed loop system
  - Both (a) and (b)
  - Neither (a) nor (b)
37. A good control system has all the following features except :-
- good stability
  - slow response
  - good accuracy
  - sufficient power handling capacity
38. What is the ROC of a causal infinite length sequence?
- $|z| < r_1$
  - $|z| > r_1$
  - $r_2 < |z| < r_1$
  - None of the mentioned
39. Inverse z-transform of the system can be calculated using:
- Partial fraction method
  - Long division method
  - Basic formula of the z-transform
  - All of the mentioned
40. Final value theorem is used for:
- All type of systems
  - Stable systems
  - Unstable systems
  - Marginally stable systems
41. If the z-transform of the system is given by  $H(z) = \frac{a+z^{-1}}{1+az^{-1}}$ . Where  $a$  is real valued:
- A low pass filter
  - A high pass filter
  - An all pass filter
  - A bandpass filter
42. In a control system the output of the controller is given to: -
- final control element
  - amplifier
  - comparator
  - sensor
43. In an open loop control system
- Output is independent of control input
  - Output is dependent on control input
  - Only system parameters have effect on the control output
  - None of the above
44. The initial response when the output is not equal to input is called
- Transient response
  - Error response
  - Dynamic response
  - Either of the above
45. In closed loop control system, with positive value of feedback gain the overall gain of the system will
- decrease
  - increase
  - be unaffected
  - any of the above
46. .... Control the data operations, control data send and receive.
- cu
  - cp
  - cpw
  - pwm



19. The time required to complete the conversion of Analog to Digital is \_\_\_\_\_ the duration of the hold mode of S/H.

- a) Greater than
- b) Equals to
- c) Less than
- d) Greater than or Equals to

20. In A/D converter, what is the time relation between sampling period T and the duration of the sample mode and the hold mode?

- a) Should be larger than the duration of sample mode and hold mode
- b) Should be smaller than the duration of sample mode and hold mode
- c) Should be equal to the duration of sample mode and hold mode
- d) Should be larger than or equals to the duration of sample mode and hold mode

21. How power supply is done to RPi?

- a) USB connection
- b) Internal battery
- c) Charger
- d) Adapter

22. What is the Ethernet/LAN cable used in RPi?

- a) Cat5
- b) Cat5e
- c) Cat6
- d) RJ45

23. What are the parameters that are default values?

- a) Port\_Name and Bits
- b) Speed and Port\_Names
- c) Speed and Parity
- d) Stop bit and Flow Control

24. What is the command used for easy using of GNU screen?

- a) \$useradd -G {dialout} your\_name
- b) Screen Port\_Name 115200
- c) Minicom -b 115200 -o -D Port\_Name
- d) Prompt> # help

25. Which instruction set architecture is used in Raspberry Pi?

- a) X86
- b) MSP
- c) AVR
- d) ARM

26. What is the default user in Debain on Raspberry Pi?

- a) Default
- b) User
- c) Pi
- d) Root

27. What are the distributions are supported by raspberry Pi?

- a) Arch Linux
- b) Debain
- c) Fedora Remix
- d) Arch Linux, Debain, and Fedora Remix

28. What bit processor is used in Pi 3?

- a) 64-bit
- b) 32-bit
- c) 128-bit
- d) Both 64 and 32 bit

29. What is the speed of operation in Pi 3?

- a) 900MHz
- b) 1.2GHz
- c) 1GHz
- d) 500MHz

30. What is the set of all values of z for which X(z) attains a finite value?

- a) Radius of convergence
- b) Radius of divergence
- c) Feasible solution
- d) None of the mentioned

31. What is the ROC of the signal  $x(n)=\delta(n-k), k>0$ ?

- a)  $z=0$
- b)  $z=\infty$
- c) Entire z-plane, except at  $z=0$
- d) Entire z-plane, except at  $z=\infty$

32. What is the ROC of the z-transform of the signal  $x(n)=a^n u(n)+b^n u(-n-1)$ ?

- a)  $|a|<|z|<|b|$
- b)  $|a|>|z|>|b|$
- c)  $|a|>|z|<|b|$
- d)  $|a|<|z|>|b|$

33. What is the ROC of z-transform of finite duration anti-causal sequence?

- a)  $z=0$
- b)  $z=\infty$
- c) Entire z-plane, except at  $z=0$
- d) Entire z-plane, except at  $z=\infty$

47. In signal processing, ..... is the reduction of a continuous-time signal to a discrete-time signal. A common example is the conversion of a sound wave (a continuous signal) to a sequence of samples (a discrete-time signal).

- A) sampling      B) A/D converter      C) D/A converter      D) DSP

48. The Ideal Sampling process can be considered as the multiplication of a pulse train with a .....

- A) continuous signal      B) discrete-time signal  
C) microcontroller      D) None of the above

49. microcomputer on a single chip called ....

- A) ROM      B) RAM      C) microcontroller      d) Memory

50. Which is the software or a programming language used for controlling of Arduino?

- a) Assembly Language      b) C Languages  
c) JAVA      d) Any Language

51 All signals are scalars. The system  $d/dt y(t) = (u(t+1))^2$  is:

- A. Causal      B. Memoryless / Static  
C. Time-Invariant      D. Linear

52. A colleague tells you that the circuit inductance is very small and can actually be neglected. The arising motor model can now be represented as...

- a) second-order system.      b) a first order system.  
c) an integrator.      d) a static system

53. Arduino IDE consists of 2 functions. What are they?

- a) Build() and loop()      b) Setup() and build()  
c) Setup() and loop()      d) Loop() and build() and setup()

54. How many digital pins are there on the UNO board?

- a) 14      b) 12      c) 16      d) 20

55. \_\_\_\_\_ board allows sewn into clothing.

- a) UNO      b) RedBoard      c) LilyPad      d) Mega

56. How many analog pins are used in Arduino Mega board?

- a) 16      b) 14      c) 12      d) 8

57. Which board is first to use microcontroller within build USB?

- a) LilyPad      b) UNO      c) RedBoard      d) Leonardo

58. \_\_\_\_\_ are pre built circuit boards that fit on top of Android.

- a) Sensor      b) Data types      c) Breadboard      d) Shields

59. processor in phone device:

- a. Microcontroller      b. Microprocessor      c. SOC      d. Sensor

60. Microprocessor heart of:

- a. Computer      b. embedded system      c. both a and b      d. Sensor

With all best wishes  
Dr. Mohamed Sabry Saraya