

Seat
No.

M.Sc. (Semester - I) (New) (CBCS) Examination: March/April-2023
ELECTRONICS
Numerical Methods (MSC21101)

Day & Date: Wednesday, 19-07-2023
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Question 1 and 2 are compulsory.
 2) Attempt any Three from Q.3 to Q.7.
 3) Figures to the right indicate full marks.

Q.1 A) Choose Correct Alternative. 10

- 1) From Laplace transform, the value of e^{ax} is _____.
 - a) $1/p$
 - b) $1/p^2$
 - c) $1/p-a$
 - d) None of the mentioned
- 2) Absolute error (e_a) = _____.
 - a) $|\text{Actual value} - \text{Approximate value}| \cdot 100$
 - b) $|\text{True value} - \text{Approximate value}| / \text{True value}$
 - c) $\text{Absolute error} / |\text{True value}|$
 - d) None of the mentioned
- 3) The final corrector of the fourth-order Runge-Kutta method uses _____.
 - a) Midpoint rule
 - b) Backward Euler method
 - c) Simpson's rule
 - d) Trapezoidal rule
- 4) The modified procedure of complete pivoting is called as _____.
 - a) Additional
 - b) Partial
 - c) Reduced
 - d) Modified
- 5) The inverse of a symmetric matrix (if it exists) is a _____.
 - a) diagonal matrix
 - b) skew symmetric matrix
 - c) symmetric matrix
 - d) triangular matrix
- 6) The value of f at x_{i+1} is same as its value at x_i is called _____.
 - a) zero-order approximation
 - b) first-order approximation
 - c) second-order approximation
 - d) all of the mentioned
- 7) The LU method of factorization was introduced by the mathematician _____.
 - a) Alan Tango
 - b) David Hilbert
 - c) G. W. Leibniz
 - d) Alex Grothendieck
- 8) $\Delta^2 y_0 = \Delta(\Delta y_0)$ is _____.
 - a) first order forward difference
 - b) second order forward difference
 - c) first order backward differences
 - d) second order backward difference
- 9) _____ is the direct method.
 - a) Gauss elimination
 - b) Gauss Jordan
 - c) Backward substitution
 - d) all of the mentioned
- 10) $\nabla f(x) = f(x+h) - f(x)$ is for _____.
 - a) Forward differences
 - b) Backward differences
 - c) Divided differences
 - d) Central differences

- B) State true/false.** **06**
- 1) Gauss Elimination Method is well adopted for computer application.
 - 2) Rounding errors are generated when only required significant digits are considered and remaining are discarded.
 - 3) Simpson's Rule used for solution of system of linear equations.
 - 4) The Laplace transform of impulse function is s.
 - 5) If $f(t) = t^n$ where, 'n' is an integer greater than zero, then its Laplace Transform is $n!$
 - 6) In triangularization method $LZ = B$ equation is solved for Z.

- Q.2 Answer the following.** **16**
- 1) Prove that $L^{-1}\{p/(p^2 - 2p + 2)(p^2 + 2p + 2)\} = 1/2 (\sin t)(\sinh t)$.
 - 2) Write a note on curve fitting.
 - 3) What is Matrix? Explain different types of the matrix.
 - 4) Explain Taylor's series method.

- Q.3** a) Prove that initial value theorem and find out Laplace transform of the LT. **08**
 b) Find out the emf observed at the temperature 25°C by fitting the following data to straight line. **08**

t(°c)	0	10	20	30
emf(mv)	53.5	59.5	65.2	70.6

- Q.4** a) Write a note on curve fitting? Derive the equation for second order least square fitting. **10**
 b) Write a note on LT. Find $L\{e^{-t}(3 \sin h2t - 5 \cos h2t)\}$ **06**

- Q.5** a) Dividing interval into 5 points find the integration of a function $I = \int_0^2 x^2 dx$ by using both Trapezoidal rule and Simpson's rule. **08**
 b) Find the equation of the cubic curve that passes through the points (-1, -8), (0,3), (2,1) and (3,2) using Lagrange's interpolation formula. **08**

- Q.6** a) Find the value of $\sin(0)$ and $\sin(18)$ by using following set of points. **08**

θ	0	10	20	30	40
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- b) Write a note on interpolation. Find out $\tan(17^\circ)$ by using Newton's forward method. **08**

x^0	0	4	8	12	16	20
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- Q.7** a) Explain forward and backward substitution method. Solve the system of equation using forward substitution method **10**

$$5x - y + z = 10$$

$$2x + 4y = 12$$

$$x + y + 5z = -1$$

- b) Prove that the existence of the Laplace transform $\int_{t_0}^{\infty} e^{-st} f(t). dt$ exists where $s > a$. **06**

Seat No.	
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**M.Sc. (Semester - I) (New) (CBCS) Examination: March/April-2023
ELECTRONICS**

Instrumentation Design (MSC21102)

Day & Date: Thursday, 20-07-2023
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Q. Nos. 1 and. 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.

Q.1 A) Fill in the blanks by choosing correct alternatives given below. 10

- 1) Mercury used in liquid-filled systems as it gives _____.
 - a) Wide temperature range
 - b) High sensitivity
 - c) Wide temperature range and high sensitivity
 - d) Wide temperature range and approximately linear scale
- 2) Strain gauge is used to monitor change in _____.
 - a) Pressure
 - b) Torque
 - c) Displacement
 - d) All of these
- 3) Isolation amplifier is also called as _____ amplifier.
 - a) High gain
 - b) Unity gain
 - c) Low gain
 - d) All of these
- 4) The popular Digital Panel Meter (DPM) is well known example of _____ data accusation system.
 - a) Single
 - b) Dual
 - c) Multi
 - d) None of these
- 5) The temperature measurement with _____ is based on the see back effect.
 - a) RTD
 - b) AD590
 - c) LM35
 - d) Thermocouple
- 6) A variable plate area transducer is made up of fixed plate _____.
 - a) Rotor
 - b) Stator
 - c) Both a and b
 - d) None of mentioned
- 7) V to I converted with grounded load the operational amplifier connected in _____ mode.
 - a) Inverting
 - b) Non inverting
 - c) Differential
 - d) All of these
- 8) In Piezoelectric transducer Quartz, Rochelle salt and _____ crystal used respectively.
 - a) Jasper
 - b) Citrine
 - c) Barium titanate
 - d) None of these
- 9) Which proximity sensor detects positioning of an object?
 - a) Optical
 - b) Inductive
 - c) Capacitive
 - d) All of these

10) The _____ switch is a type of sensor that detects the presence and absences of an object.

- a) Active
- b) Passive
- c) Limit
- d) All of these

B) State true or false**06**

- 1) The SY-HS220 is the precision temperature sensor.
- 2) Data logger which are used to measure and record the data.
- 3) The LM35 temperature sensor linear scale factor + 10.0 mV/°C.
- 4) AD524 has an output offset voltage drift of less than 25 $\mu\text{V}/^\circ\text{C}$
- 5) A proximity sensor is a non-contact sensor.
- 6) Disc thermistor having resistance value of 100 ohm to 1 M ohms.

Q.2 Answer the following**16**

- a) Sketch block diagram of electronics instrument design for measurement.
- b) Short note on single channel DAS.
- c) What is need of 4 to 20mA current transformation?
- d) Write a short note on selection criteria for transducers.

Q.3 Answer the following

- a) Explain pre-amplifier. And Write a note on AD620.
- b) Explain the techniques of measuring level of liquid.

08**08****Q.4 Answer the following**

- a) Explain the concept of grounding and write a note on AD524.
- b) What is signal conditioning? Explain IC 2B30.

10**06****Q.5 Answer the following**

- a) Explain in detail I to V and V to I converter.
- b) What is sensor? Explain static and dynamic characteristics of sensor.

08**08****Q.6 Answer the following**

- a) Explain signal transmission in detail.
- b) What is isolation amplifier? Explain in detail model 289 isolation amplifier.

08**08****Q.7 Answer the following**

- a) Explain with suitable circuit diagram the designing of AC bridges. And note on electrostatic shielding.
- b) Write a note on programmable instrumentation amplifier.

10**06**

- B) Write True or False.** **06**
- 1) Three phase full converter exhibits four quadrant operation.
 - 2) Inverters can be used in standby power supply.
 - 3) Class A chopper is also known as step up chopper.
 - 4) Cycloconverters can be used to drive high power loads.
 - 5) DC Choppers can be designed using SCRs.
 - 6) The output current of current source inverter depends upon the nature of the load.
- Q.2 Answer the following.** **16**
- a) Draw a neat labeled circuit diagram of three phase Dual converter.
 - b) Define rectifiers. Give its classification.
 - c) Draw a neat labeled circuit diagram of Mc Murray full bridge inverter.
 - d) Explain EAC technique for power factor improvement.
- Q.3 Answer the following.**
- a) Describe the working of three phase half controlled rectifier. **08**
 - b) Describe the operation of single phase bidirectional controller. **08**
- Q.4 Answer the following.**
- a) Explain the working of single phase full controlled bridge rectifier with R-L load. **10**
 - b) Discuss the operation of class B chopper. **06**
- Q.5 Answer the following.**
- a) Describe the operation of single phase full bridge inverter in detail. **10**
 - b) Draw a neat labeled diagram of three phase full wave controller for R-L load. **06**
- Q.6 Answer the following.**
- a) Discuss single phase fully controlled bridge rectifier with R load for $\alpha < \pi/2$. **10**
 - b) Discuss step up cycloconverter. **06**
- Q.7 Answer the following.**
- a) Explain the working of single phase bridge type cycloconverter. **10**
 - b) Explain operating principle of inverter. Discuss its types. **06**

Seat No.	
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**M.Sc. (Semester - I) (New) (CBCS) Examination: March/April-2023
ELECTRONICS**

Advanced Microcontrollers (MSC21108)

Day & Date: Saturday, 22-07-2023
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.

Q.1 A) Choose correct alternative.

10

- 1) What is the file extension that is loaded in a microcontroller for executing any instruction?
 - a) .doc
 - b) .c
 - c) .txt
 - d) .hex
- 2) Where does the comparison level occur for 16-bit contents in the compare mode operation?
 - a) Between CCPR1 register & TMR1
 - b) Between CCPR1 & CCPR2 registers
 - c) Between CCPR2 register & TMR1
 - d) Between CCPR2 register & TMR0
- 3) Which bits play a crucial role in specifying the details or reasons associated with the system wake-up in WDT?
 - a) \overline{PD} & $\overline{T0}$
 - b) C & Z
 - c) DC & RPO
 - d) All of the above
- 4) When do the special address 004H get automatically loaded into the program counter?
 - a) After the execution of RESET action in program counter.
 - b) After the execution of 'goto Mainline' instruction in the program memory.
 - c) At the occurrence of interrupt into the program counter.
 - d) At the clearance of program counter with no value.
- 5) The _____ bit of Status Register of AVR used as source or destination for the operated bit.
 - a) T
 - b) S
 - c) D
 - d) None of these
- 6) Which operational feature of PIC allows it to reset especially when the power supply drops the voltage below 4V?
 - a) Built-in Power-on-reset
 - b) Brown-out reset
 - c) Both a & b
 - d) None of the above
- 7) SWAP instruction is _____.
 - a) Data transfer instruction
 - b) Program control instruction
 - c) Logical instruction
 - d) Bit and Bit test instruction

- 8) In AVR microcontrollers, ADD instruction affects the status of which of the following bits of a status register?
- a) Z
 - b) N
 - c) C
 - d) All of the mentioned
- 9) The MCU is _____ when the Watchdog Timer period expires and the Watchdog is enabled.
- a) in sleep mode
 - b) reset
 - c) in ideal mode
 - d) Both a and c
- 10) The USART Transmitter is enabled by setting the Transmit Enable (TXEN) bit in the _____ Register.
- a) UBRRL
 - b) UBRRH
 - c) UCSRB
 - d) UCSR

B) State true or false.**06**

- 1) In AVR, the LCD operates in two main modes, it can be in 8 bit or 4 bit data.
- 2) In PIC Microcontroller 0004H is address of reset vector.
- 3) The PIR1 register contains the individual flag bits for the peripheral interrupts.
- 4) AVR Microcontroller have Two 8-bit Timer/Counters with Separate Pre-scaler, one Compare Mode.
- 5) The R26 and R27 used as single 16 bit Y register.
- 6) The Status register contains the arithmetic status of the ALU.

Q.2 Answer the following.**16**

- a) Write a note on Status register of PIC Microcontroller.
- b) Explain the concept Developing, compiling, and programming the Microcontroller in short.
- c) Write any 8 features of AVR Microcontroller.
- d) Draw the Reset circuit and clock circuit of AVR Microcontroller.

Q.3 a) Explain universal asynchronous receiver and transmitter of AVR Microcontroller.

08

b) Explain addressing modes of PIC Microcontroller.

08

Q.4 a) Draw the architecture of AVR microcontroller and explain in details.

10

b) Write note on Compare capture mode.

06

Q.5 a) Draw the Diagram for LCD interfacing to PIC and Write its program.

08

b) Explain Logical instructions set of AVR Microcontroller.

08

Q.6 a) Explain Timer 2 of PIC Microcontroller.

10

b) Write note on Register banks of AVR Microcontroller.

06

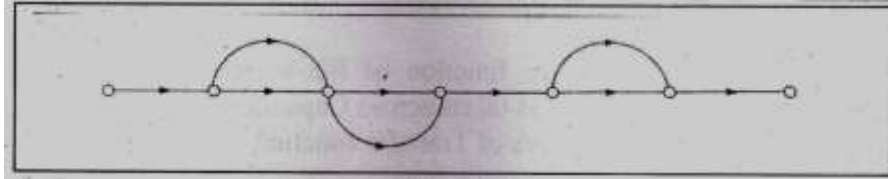
Q.7 a) Explain interfacing of Opto-coupler to Microcontroller with suitable diagram and program.

10

b) Write a note on Interrupts in PIC microcontrollers.

06

10) The number of forward paths of the below signal flow graph is _____.



- a) 3
- b) 6
- c) 5
- d) 7

B) Write true or false.

06

- 1) An automatic toaster system is an example of closed loop system.
- 2) Feedback increases the stability of the system.
- 3) Chain node of SFG has branches in both directions.
- 4) Type 2 system has zero poles at the origin.
- 5) Root locus technique gives quick transient and stability response.
- 6) SFG uses division rule.

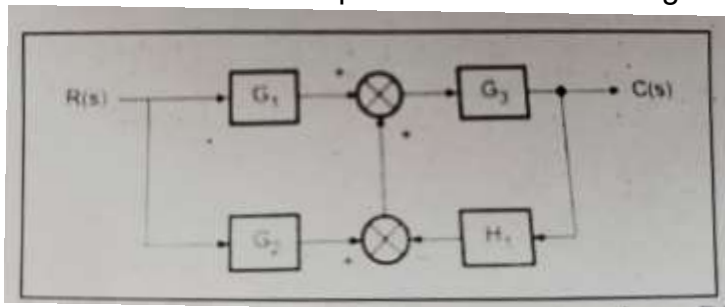
Q.2 Answer the following.

16

- a) State any two properties of Signal flow graph. Justify each with an example.
- b) Write a note on regenerative feedback.
- c) Write a note on Poles and Zeros of the Transfer function of the system.
- d) Define the terms plant, input, output and disturbance in a Control system.

Q.3 Answer the following.

- a) From the following block diagram draw the corresponding signal flow graph and evaluate closed loop transfer function using mason's gain formula. 10



- b) Define the transient time response specifications Delay time, Rise time, Peak time. 06

Q.4 Answer the following.

- a) Describe in detail the Nyquist's criteria for the stability of the system. 10
- b) With suitable example describe the closed loop control system. 06

Q.5 Answer the following.

- a) Define the term root locus. With suitable example discuss the angle condition and magnitude condition. 10
- b) Write a note polar plot. 06

Q.6 Answer the following.

- a) Compare the Block Diagram representation and Signal flow graph. 10
- b) Examine the stability of control system having characteristic equation $S^3+4S^2+S+6 = 0$ by Routh's Criterion. 06

Q.7 Answer the following.

- a) Derive expression for transfer function of the system consisting R and C connected in series and output is taken across Capacitor. 10
- b) Give the advantages and features of Transfer function. 06

Seat No.	
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M.Sc. (Semester - II) (New) (CBCS) Examination: March/April-2023
ELECTRONICS
Real Time Operating System (MSC21202)

Day & Date: Sunday, 23-07-2023
 Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- Instructions:** 1) Question 1 and 2 are compulsory.
 2) Attempt any Three from Q.3 to Q.7.
 3) Figure to right indicate full marks.

Q.1 A) Choose correct alternatives.

10

- 1) The _____ are useful for the enforcement of mutual exclusion and also provide an effective means of inter-process communication.
 - a) Semaphores
 - b) Messages
 - c) Monitors
 - d) Addressing
- 2) The strategy of making processes that are logically runnable to be temporarily suspended is called _____.
 - a) Non preemptive scheduling
 - b) Preemptive scheduling
 - c) Shortest job first
 - d) First come First served
- 3) Which can be considered as the lower level in the multitasking operating system?
 - a) process
 - b) task
 - c) threads
 - d) multi threads
- 4) Which term is used to encompass more than a simple context switch?
 - a) process
 - b) single thread system
 - c) threads
 - d) multithreads
- 5) Choose one of the disadvantages of the priority scheduling algorithm?
 - a) it schedules in a very complex manner
 - b) its scheduling takes up a lot of time
 - c) it can lead to some low priority process waiting indefinitely for the CPU
 - d) none of the mentioned
- 6) If the semaphore value is negative _____.
 - a) its magnitude is the number of processes waiting on that semaphore
 - b) it is invalid
 - c) no operation can be further performed on it until the signal operation is performed on it
 - d) none of the mentioned
- 7) On Linux which of the following is not a valid file type _____.
 - a) Socket
 - b) Inode
 - c) Softlinked
 - d) FIFO

- 8) AVR ATmega8L microcontroller has _____ of In-System Self-programmable Flash program memory.
 - a) 1Kbytes
 - b) 4Kbytes
 - c) 8Kbytes
 - d) 16Kbytes
- 9) Priority inversion is solved by use of _____.
 - a) priority inheritance protocol
 - b) two phase lock protocol
 - c) time protocol
 - d) all of the mentioned
- 10) The amount of time required for the scheduling dispatcher to stop one process and start another is known as _____.
 - a) event latency
 - b) interrupt latency
 - c) dispatch latency
 - d) context switch

B) State true or false

06

- 1) AVR ATmega8L microcontroller has one 8-bit Timer.
- 2) The advantages of real-time operating systems is Maximum utilization of devices and systems.
- 3) Hard real time operating system has Less jitter than a soft real time operating system.
- 4) In a real time operating system a task must be serviced by its deadline period.
- 5) For real time operating systems, interrupt latency should be Zero.
- 6) In Real Time OS, the response time is very critical.

Q.2 Answer the following.

16

- a) Write note on Binary semaphore.
- b) Write note on Mailboxes
- c) What is mean by Priority Inversion?
- d) Explain the structure of embedded system.

Q.3 a) Explain concept Inter task Communication.

08

- b) Write difference between Hard and Soft Real Time Systems.

08

Q.4 a) Explain in detail Scheduling Algorithm.

10

- b) Write concept of Sharing of resources.

06

Q.5 a) Explain in detail Round Robin scheduling.

08

- b) Write note on Kernel Objects.

08

Q.6 a) Design embedded systems for Measurement of pH.

10

- b) Write note on POSIX Pthreads.

06

Q.7 a) Explain in detail Messages, Queues.

10

- b) Write note on context switching.

06

- 10) RI of core is higher than that of cladding because _____.
 a) better confinement of light
 b) maximum distance operation
 c) easy to handle
 d) higher life time of material

B) State True or False. 06

- 1) To be used as photo detector, PIN diode should be connected forward bias.
- 2) Glass having the highest refractive index
- 3) Higher emission efficiency is applicable for LASER.
- 4) Photo detector is square law device.
- 5) The relation between bandwidth of an optical fiber and NA is $BW \propto 1/NA$.
- 6) In the first window of optical fiber, light source are generally GaAlAs.

Q.2 Answer the following. 16

- a) Compare step index fiber and graded index fiber.
- b) What are the different advantages of optical fiber communication?
- c) A step-index fiber has a numerical aperture of 0.26, a core refractive index of 1.5 and a core diameter of 100 micrometer. Calculate the acceptance angle.
- d) Write a note on splicing and connectors.

Q.3 Answer the following. 16

- a) Explain the techniques of glass fiber fabrication.
- b) Describe briefly PIN photodiode.

Q.4 Answer the following. 16

- a) Explain the working of pocket cell as modulator and Kerr modulator.
- b) Explain the construction and principle of operation of He-Ne laser.

Q.5 Answer the following. 16

- a) Explain working principle and characteristics of photo transistors.
- b) Explain terms:
 - i) NA
 - ii) Acceptance angle
 - iii) acceptance cone

Q.6 Answer the following. 16

- a) With neat diagram describe the elements of optical fiber communication System.
- b) Describe briefly the action of LED with its types.

Q.7 Answer the following. 16

- a) Discuss the operation of APD with neat sketch.
- b) What is modulation? Discuss intensity modulation with special reference to fiber optic instrumentation.

Seat No.	
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**M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ELECTRONICS**

Digital Signal Processing (MSC21301)

Day & Date: Monday, 10-07-2023
Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- Instructions:** 1) Question 1 and 2 are compulsory.
2) Attempt any Three from Q.3 to Q.7.
3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternatives from the given options. 10

- 1) Sampling rate conversion by the rational factor I/D is accomplished by _____ connection of interpolator and decimator.
 - a) Parallel
 - b) Cascade
 - c) Convolution
 - d) None of the mentioned
- 2) The Fourier transform of real valued time signal has _____.
 - a) odd symmetry
 - b) even symmetry
 - c) conjugate symmetry
 - d) no symmetry
- 3) An IIR system with system function $H(z) = B(z)/A(z)$ is called a minimum phase if _____.
 - a) All poles and zeros are inside the unit circle
 - b) All zeros are outside the unit circle
 - c) All poles are outside the unit circle
 - d) All poles and zeros are outside the unit circle
- 4) 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 _____.
 - a) Uni-lateral Z-transform
 - b) Bi-lateral Z-transform
 - c) Tri-lateral Z-transform
 - d) None of the mentioned
- 5) In bilinear transformation, the left-half s -plane is mapped to _____ statement in the z -domain.
 - a) Entirely outside the unit circle $|z| = 1$
 - b) Partially outside the unit circle $|z| = 1$
 - c) Partially inside the unit circle $|z| = 1$
 - d) Entirely inside the unit circle $|z| = 1$
- 6) Final value theorem is used for _____.
 - a) All type of systems
 - b) Stable systems
 - c) Unstable systems
 - d) marginally stable systems
- 7) If we reverse the directions of all branch transmittances and interchange the input and output in the flow graph, then the resulting structure is called as _____.
 - a) Direct form - I
 - b) Direct form - II
 - c) Transposed form
 - d) None of the mentioned
- 8) _____ is the odd component of the signal $x(t) = e^{(jt)}$
 - a) $\cos t$
 - b) $j \sin t$
 - c) $j \cos t$
 - d) $\sin t$

Seat No.	
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**M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ELECTRONICS**

Advanced Digital Design with VHDL (MSC21302)

Day & Date: Tuesday, 11-07-2023
Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- Instructions:** 1) Q. Nos. 1 and. 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.

Q.1 A) Choose correct answer.

10

- 1) The VHDL is utilized for _____ design.
 - a) Analog
 - b) Digital
 - c) both a & b
 - d) none of these
- 2) The meaning of 'L' is _____ in Data Types STD_LOGIC_1164.
 - a) Low
 - b) 0
 - c) weak 0
 - d) all of these
- 3) The place and route is included in _____ end level design.
 - a) Back
 - b) Front
 - c) both a & b
 - d) Mixed
- 4) The exit and next statements are used only _____ loop statement.
 - a) Outside
 - b) Inside
 - c) both a & b
 - d) none of these
- 5) The package std_logic_1164 is accessed by _____ clause.
 - a) Library
 - b) Use
 - c) Type
 - d) Both a & b
- 6) The Generate statement is _____ statement.
 - a) Sequential
 - b) Concurrent
 - c) Process
 - d) All of these
- 7) The _____ value is assigned by <= assignment operator.
 - a) Signal
 - b) Variable
 - c) Constant
 - d) All of these
- 8) The _____ are the programming technologies used for PLD.
 - a) SRAM
 - b) EPROM
 - c) Flash
 - d) all of these
- 9) The LOOP statement is used to iterate through the set of _____ statement.
 - a) Sequential
 - b) Concurrent
 - c) both a & b
 - d) Mixed
- 10) The VHDL is _____ description language.
 - a) Software
 - b) Hardware
 - c) both a & b
 - d) Logic

- B) State True or False.** **06**
- 1) The data attributes return data information regarding a data vector.
 - 2) The '&' operator is addition operator used in VHDL code.
 - 3) The WAIT statement is a concurrent statement.
 - 4) The PLD devices are utilized for analog logic circuit design.
 - 5) The operator NAND and NOR are not associative.
 - 6) The PROCESS statement is itself concurrent statement.
- Q.2 Answer the following.** **16**
- a) Explain basic terminology of VHDL.
 - b) Discuss advantages of VHDL.
 - c) Explain the syntax of Process statement.
 - d) Explain the architecture of FPGA.
- Q.3**
- a) State and Explain the role of various types of architecture bodies in VHDL using suitable example. **10**
 - b) Write VHDL code for 8:1 demux using behavioral modelling. **06**
- Q.4**
- a) Explain the various language element of VHDL and Explain operators in detail. **10**
 - b) Write VHDL code for serial in serial out shift register. **06**
- Q.5**
- a) What do you mean Attributes and Generic. Explain it with suitable example. **10**
 - b) Write VHDL code for 8-bit input comparator. **06**
- Q.6**
- a) Explain the LOOP statement in detail with suitable example. **10**
 - b) Write VHDL code for 3:8 decoder. **06**
- Q.7**
- a) Explain the EDA tools. Write a note on Macrocell. **10**
 - b) Write VHDL code for one digit counter. **06**

Seat No.	
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**M.Sc. (Semester - III) (New) (CBCS) Examination: March/April-2023
ELECTRONICS**

ARM Microcontroller and system design (MSC21306)

Day & Date: Wednesday, 12-07-2023
Time: 11:00 AM To 02:00 PM

Max. Marks: 80

- Instructions:** 1) Q. Nos. 1 and 2 are compulsory.
2) Attempt any three questions from Q. No. 3 to Q. No. 7
3) Figure to right indicate full marks.

Q.1 A) Fill in the blanks by choosing correct alternatives given below. 10

- 1) _____ is the founder of LPC2148 board.
 - a) Intel
 - b) Atmel
 - c) Motorola
 - d) Philips
- 2) The main importance of ARM micro-processors is providing operation with _____.
 - a) Low cost and low power consumption
 - b) Higher degree of multi-tasking
 - c) Lower error or glitches
 - d) Efficient memory management
- 3) ARM7TDM1 controller is present in _____.
 - a) 128 bit
 - b) 8 bit
 - c) 64 bit
 - d) 32 bit
- 4) The USB controller provides high speed interface to laptop or PC with a speed of _____.
 - a) On-chip USB with 12Mb/s
 - b) On-chip USB with 15Mb/s
 - c) Peripheral USB with 12Mb/s
 - d) Peripheral USB with 15Mb/s
- 5) The address space in ARM is _____.
 - a) 2^{24}
 - b) 2^{64}
 - c) 2^{16}
 - d) 2^{32}
- 6) The ARM instruction set architecture divided into _____ classes of instructions.
 - a) Two
 - b) Four
 - c) Six
 - d) Eight
- 7) When the processor is executing in jazelle state, then all instructions are _____ wide.
 - a) 16 bit
 - b) 8 bit
 - c) 32 bit
 - d) 64 bit
- 8) Single 10-bit DAC provides variable _____ output.
 - a) Digital
 - b) Analog
 - c) Analog and digital
 - d) Neither analog nor digital
- 9) The ARM and thumb instruction set and java byte codes are _____ instruction set.
 - a) Java
 - b) Jazelle
 - c) ARM
 - d) None of these

- 10) AMBA bus stands for _____.
 a) ARM Microcontroller Bus Architecture
 b) Advanced Microcontroller Bus Architecture
 c) ARM Microprocessor Bus Architecture
 d) None of the mentioned

B) State true or false 06

- 1) LPC2148 provides real time debugging with the on chip real monitor software.
- 2) USB 2.0 full speed compliant device controller with 8KB of end point RAM.
- 3) The ARM processors don't support Byte addressability.
- 4) LPC2148 have in system programming or in application programming
- 5) All instructions in ARM are conditionally executed.
- 6) ARM processors where basically designed for mobile system.

Q.2 Answer the following 16

- a) What are the features of LPC2148?
- b) Write a note on SPSR.
- c) Explain the Multiply instruction.
- d) What are the types of CORTEX-M series?

Q.3 Answer the following

- a) Explain the architecture of LPC2148 and its features. 10
- b) Explain the operation of ARM pipeline for simple instructions. 06

Q.4 Answer the following

- a) Explain the designing of embedded system for the interfacing of relay using LPC2148. 10
- b) Explain the bus technology? Describe the APB bus architecture of ARM processor. 06

Q.5 Answer the following

- a) What are the features of LPC2148? Explain the timers and counters of LPC2148. 08
- b) Explain Arithmetic and Logical instructions in ARM processor with examples. 08

Q.6 Answer the following

- a) Explain the PLL0 and PLL1 of LPC2148. 08
- b) Explain the I²C bus serial I/O controller. 08

Q.7 Answer the following

- a) What is interfacing? Explain the development of embedded system for the interfacing of temperature using LPC2148. 10
- b) Explain Interrupt latencies of ARM processor. 06

- B) State true or false** **06**
- 1) The carrier mobility μ is given by V/E .
 - 2) PMS is not a design environment.
 - 3) The typical value of process gain factor K_p is given by 10 to 30.
 - 4) Transistor gain factor β is independent of V_{ds} .
 - 5) Ge is the starting material for the fabrication of MOS device.
 - 6) β_n/β_p ratio of 10 is desirable.
- Q.2 Answer the following** **16**
- a) Write a note β_n/β_p ratio.
 - b) Draw the structure of CMOS inverter. Explain its working.
 - c) Give the features and advantages of SOI process of fabrication.
 - d) Write a note on I_d - V_{ds} relationship.
- Q.3 Answer the following**
- a) Describe the operation of nMOS enhancement transistor. **10**
 - b) What is the oxidation process in the CMOS fabrication? Explain its two types. **06**
- Q.4 Answer the following**
- a) Explain the switching characteristics of MOS device. **08**
 - b) Explain the working of transmission gate. **08**
- Q.5 Answer the following**
- a) Explain the concept of power dissipation. Discuss its types. **10**
 - b) Explain the operation of pseudo nMOS transistor. **06**
- Q.6 Answer the following**
- a) Discuss the representation issues of digital Electronic Design. **08**
 - b) Describe the process of placement in CAD. **08**
- Q.7 Answer the following**
- a) With neat diagram discuss the latchup. Give the techniques of latchup prevention. **08**
 - b) With neat diagram discuss the concept of threshold voltage in MOS device. **08**

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**M.Sc. (Semester - IV) (New) (CBCS) Examination March/April-2023
ELECTRONICS**

Microwave Devices, Antennas and Measurements (MSC21401)

Day & Date: Monday, 10-07-2023
Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Question 1 and 2 are compulsory.
2) Attempt any Three from Q.3 to Q.7.
3) Figure to right indicate full marks.

Q.1 A) Choose the correct alternatives from the given options. 10

- 1) The power gain of a half wave dipole with respect to an isotropic radiator is _____.
 - a) 1 db
 - b) 2.15 db
 - c) 3 db
 - d) 6 db
- 2) The scattering parameters are used to indicate _____.
 - a) Permittivity and permeability
 - b) Electric and magnetic field intensities
 - c) Reflection and transmission coefficients
 - d) Frequency and wavelength
- 3) GaAs is used in fabricating Gunn diode. Gunn diode is _____.
 - a) bulk device
 - b) sliced device
 - c) made of different type of semiconductor layers
 - d) none of the mentioned
- 4) The dominant wave should have _____.
 - a) no phase shift
 - b) no attenuation
 - c) highest cut-off frequency
 - d) lowest cut-off frequency
- 5) _____ microwave tube uses buncher and catcher cavities.
 - a) Magnetron
 - b) Klystron
 - c) Reflex klystron
 - d) Travelling wave tube
- 6) Polarization of EM wave is in _____.
 - a) the direction of electric field
 - b) the direction of magnetic field
 - c) the directions of electric and magnetic field
 - d) none of the mentioned
- 7) _____ is not an Omni-directional antenna.
 - a) Half-wave dipole
 - b) Log periodic
 - c) Discone
 - d) Marconi
- 8) Under ideal conditions, when a PIN diode is used as a switch, the switch must have _____ insertion loss in the ON state.
 - a) Zero
 - b) Maximum
 - c) Average
 - d) Insertion loss cannot be defined for a switch

- 9) Maxwell's equation for electromagnetic waves in a waveguide is _____.
 a) $\nabla \times E = -j\omega\mu(\text{vector } E)$ b) $\nabla \times E = -j\omega\mu(\text{vector } H)$
 c) $\nabla \times H = -j\omega\mu(\text{vector } H)$ d) $\nabla \times H = j\omega\mu(\text{vector } H)$
- 10) The correct sequence to find H, when D is given is _____.
 a) D-E-B-H
 b) D-B-E-H
 c) It cannot be computed from the data given
 d) D-H

B) State true or false.

06

- 1) The SWR on a transmission line is infinity; the line is terminated in complex impedance.
- 2) A hollow rectangular waveguide does not support TEM mode of propagation
- 3) The first Maxwell law is based on Faraday and Lenz law.
- 4) A major disadvantage of klystron amplifier is Low bandwidth.
- 5) The parameters S_{11} and S_{12} indicate the transmission coefficients.
- 6) When the separation between two lines that carry the TEM wave approaches λ the wave tends to be radiated.

Q.2 Answer the following.

16

- a) What is Microwave? What are the applications of microwave?
- b) Write a note on Multicavity Klystron Amplifiers.
- c) What is antenna? Explain Horn Antenna.
- d) Distinguish between Transmission Line and Waveguide

Q.3 a) Write a note on Rat Race Junction. Explain Directional Couplers.

08

- b) Derive the wave equation in good conductor.**

08

Q.4 a) What are the Maxwell's equations? Explain with its boundary conditions.

10

- b) Write a note on Gunn Effect. Explain InP Diode.**

06

Q.5 a) Explain Modes in waveguides. Derive the wave equation for TE and TM waves.

08

- b) What is SWR? Explain SWR of impedance and admittance.**

08

Q.6 a) Write a note on transmission line. Derive the transmission line equation.

08

- b) Discuss slot and microstrip antennas.**

08

Q.7 a) A certain transmission line has a characteristics impedance is $[75 + j0.01\Omega]$ and is terminated in load impedance of $[70 + j50\Omega]$ compute.

10

- 1) Reflection coefficient (Γ)
- 2) Transmission coefficient (T)
- 3) $T^2 = \frac{z_l}{z_0} [1 - \Gamma_1^2]$

- b) Explain Reflex Klystrons tube and RWH theory.**

06

10) _____ can be used to transfer an IPv4 packet to the device with IPv4 address through IPv6 region.

- a) Dual stacking
- b) Piggybacking
- c) Header translation
- d) Tunneling

B) State true or false **06**

- 1) The ATM is byte relay Protocol.
- 2) The RG-58 is used for thin Ethernet.
- 3) HTTP functions are combination of UDP and TCP.
- 4) Performance of the following is not a characteristic of data flow.
- 5) Unshielded twisted pair cables are used in 10 Base-T network.
- 6) A Bluetooth device has a range is 100m.

Q.2 Answer the following **16**

- a) Explain SMTP.
- b) Write a note on ATM Technology.
- c) Describe IPv6 Addresses.
- d) Explain HDLC protocol.

Q.3 Answer the following **08**

- a) Describe the Addressing of TCP/IP. **08**
- b) What is mean by Network? Explain categories of Network. **08**

Q.4 Answer the following **10**

- a) Explain Remote Logging and Electronic mail. **10**
- b) Explain Architecture of IEEE 802.11. **06**

Q.5 Answer the following **08**

- a) Discuss Connecting devices. **08**
- b) Explain IP Security. **08**

Q.6 Answer the following **08**

- a) Explain WWW and HTTP. **08**
- b) Explain SONET Network. **08**

Q.7 Answer the following **10**

- a) Discuss the OSI model in detail. **10**
- b) Write a note on stop and wait ARQ protocol. **06**

Seat No.	
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M.Sc. (Semester - IV) (New) (CBCS) Examination: March/April-2023
ELECTRONICS
Nanoelectronics (MSC21403)

Day & Date: Friday, 14-07-2023
 Time: 03:00 PM To 06:00 PM

Max. Marks: 80

- Instructions:** 1) Question no. 1 and 2 are compulsory.
 2) Attempt any three questions from Q. No. 3 to Q. No. 7.
 3) Figure to right indicate full marks.

Q.1 A) Choose correct answer. 10

- 1) In _____ lithography, a film of water or another dielectric medium is inserted in between the lens and wafer.
 - a) Optical
 - b) electron beam
 - c) Immersion
 - d) ultraviolet
- 2) If characteristics $\lambda > L_x$ and $L_x \ll L_z, L_y$ then it stands for quantum _____.
 - a) Dot
 - b) Wire
 - c) Well
 - d) artificial
- 3) For a _____ photoresist, the resist material is initially insoluble and through a chemical reaction when exposed to light it become soluble.
 - a) positive
 - b) negative
 - c) Lithography
 - d) IC
- 4) For triangular well, the energy levels (E_n) are proportional to _____.
 - a) $n^{2/3}$
 - b) n
 - c) n^2
 - d) $n^{1/3}$
- 5) The transistor having 100nm dimensions obeys_____ principle.
 - a) Quantum
 - b) classical physics
 - c) both a & b
 - d) none of these
- 6) The parabolic as well as square well wave functions solutions are _____ due to the symmetry of the potential well.
 - a) symmetric or antisymmetric
 - b) Sine functions
 - c) neither asymmetric or antisymmetric
 - d) Cosine functions
- 7) The synonym of MODFET is _____.
 - a) modulation doped FET
 - b) Modulation oxide doped FET
 - c) modulation oxide FET
 - d) None of these
- 8) The SiGe heterojunctions have _____ lattice constant difference between Si and Ge, which is about 4%.
 - a) Small
 - b) Large
 - c) Equal
 - d) None of these
- 9) The OLED's are an electroluminescent organic material between two _____ of different work functions.
 - a) Semiconductors
 - b) Nonconductors
 - c) insulator
 - d) conductors

- 10) In case of Type I multiple quantum well (MQW) the wells for hole and electron are located in the _____ space location.
- | | |
|--------------|---------------|
| a) Alternate | b) Same |
| c) Different | d) triangular |

B) State true or false.

06

- 1) The zero DEG structure is often called as artificial atoms
- 2) The organic semiconductor has π and σ bonds
- 3) The homo-structures are made from the same material with non-uniform doping.
- 4) The motion of particle in the nanoworld is determined by wave and quantum mechanics.
- 5) If $\lambda > L_x, L_y$ and $L_x, L_y \ll L_z$ then it stands for quantum well.
- 6) The particle moves throughout the structure without scattering is called diffusive regime of particle.

Q.2 Answer the following.

16

- a) Explain the quantum well and dots in brief considering the lengths.
- b) Discuss advantages of the nanostructures over microelectronics.
- c) Discuss nanotechnology and nanoelectronics.
- d) Explain the lithography technique for nanostructure fabrication.

Q.3 Answer the following.

- a) What do you mean by MOSFET structures?
- b) Write a note on quantum wire.

10
06

Q.4 Answer the following.

- a) Explain the characteristics lengths in nanostructures.
- b) Write on nanoimprint lithography.

10
06

Q.5 Answer the following.

- a) Explain in detail Heterojunctions.
- b) Explain the triangular quantum well.

10
06

Q.6 Answer the following.

- a) Explain the concept of superlattice and discuss the Kronig-Penney model of superlattice.
- b) Write a note on multiple quantum well.

10
06

Q.7 Answer the following.

- a) Explain in detail tunneling effect and tunneling elements.
- b) Write a note on OLED.

10
06

- 10) Parallel connection of ladder logic is typically called ____.
- a) Coils
 - b) Rungs
 - c) Networks
 - d) Branches

B) State true or false.**06**

- 1) The I/O task is a heart of a SCADA system.
- 2) The programming device is a brain of a PLC system.
- 3) The abbreviations NO and NC represent the electrical state of switch contact when the switch is not actuated.
- 4) The conventional relay operated faster than PLC.
- 5) The memory map of PLC for input image status area is 8 words.
- 6) RTU stands for Remote Transmitter Unit.

Q.2 Answer the following.**16**

- a) Explain profibus for SCADA.
- b) Explain subtraction functions of PLC.
- c) What are the types of control systems in mechatronics?
- d) List down PLC programming methods.

Q.3 Answer the following.**a) Explain in detail basic architecture of DCS.****08****b) Write a note master control relay and sequencer functions in PLC.****08****Q.4 Answer the following.****a) Explain the design of ladder diagram for process control description.****10****b) Write a note on serial communication in PLC.****06****Q.5 Answer the following.****a) Explain open and closed loop system in mechatronics.****08****b) Explain SCADA protocols.****08****Q.6 Answer the following.****a) Explain advantages and disadvantages of mechatronics systems.****08****b) Explain programming for ON-OFF inputs and ON-OFF Outputs in PLC.****08****Q.7 Answer the following.****a) Explain in detail architecture of CCS system.****10****b) Write a note on IO modules and their characteristics in PLC.****06**

- B) Write true or false.** **06**
- 1) Nyquist sampling theorem states that the sampling signal frequency should be half the input signal's highest frequency.
 - 2) SWAP instruction used to exchange the content.
 - 3) SRAM stores only local variable in M8C processor of PSoC1.
 - 4) The delta sigma ADC consist buffer, decimator and modulator blocks.
 - 5) PSoC 5 consists of ARM Cortex as processing core.
 - 6) BiCMOS is the combination of BJT and CMOS transistor.
- Q.2 Answer the following.** **16**
- a) Write a note on memory subsystem.
 - b) Describe continuous time analog block as integrator.
 - c) Write a note on Quantization.
 - d) Write a note on programmable gain amplifier.
- Q.3 Answer the following.**
- a) What is Nyquist theorem for sampling? Describe with suitable block diagram first order delta sigma ADC. **10**
 - b) Characteristics of Mixed Signal VLSI design. **06**
- Q.4 Answer the following.**
- a) With suitable block diagram describe the design of mixed signal based system on chip for measurement of temperature. **10**
 - b) Describe switched capacitor block as comparator. **06**
- Q.5 Answer the following.**
- a) With suitable diagram describe fundamental architecture of digital PSoC block. **08**
 - b) Draw a diagram for summing amplifier based on switched Capacitor Principal and explain it. **08**
- Q.6 Answer the following.**
- a) What are subsystems of PSoC1 device? Describe in detail Clock system of the PSoC devices. **08**
 - b) Write a note on configuration of global IO ports of PSoC 1. **08**
- Q.7 Answer the following.**
- a) With block diagram describe architecture of M8C core. **08**
 - b) Describe in detail SPI block of PSoC device. **08**