

**University of Mumbai**  
**Examination 2022**

Time: 2 hour 30 Mins

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
Q1.	Which evaporator is used in Sugar industry:
Option A:	Horizontal tube
Option B:	Long tube vertical - climbing film
Option C:	Short tube vertical
Option D:	Falling film vertical
Q2.	Some examples of heat exchanger are: 1. Condensers and evaporators in refrigeration units. 2. Evaporator of an ice plant and milk chiller of a pasteurizing plant. 3. Automobile radiators and oil coolers of heat engines. Identify the correct answer
Option A:	1 only
Option B:	2 and 3
Option C:	1, 2 and 3
Option D:	1 and 2
Q3.	Shrinking Effect takes place when
Option A:	water starts boiling
Option B:	cold water is added
Option C:	steam production increases
Option D:	combustion is absent
Q4.	In parallel flow heat exchangers,
Option A:	The exit temperature of hot fluid is always equal to the exit temperature of cold fluid
Option B:	The exit temperature of hot fluid is always less than the exit temperature of cold fluid
Option C:	The exit temperature of hot fluid is always more than the exit temperature of cold fluid
Option D:	We cannot predict comparison between exit temperatures of hot fluid and cold fluid
Q5.	The following is an accessory of a boiler.
Option A:	Pressure gauge

Option B:	Safety valve
Option C:	Fusible plug
Option D:	Superheater
Q6.	In a furnace employing forced draught as compared to induced draught,
Option A:	Air is sucked in, so air leaks are more and hence the furnace efficiency is reduced.
Option B:	The fan operates hot and hence blades are liable to corrosion and erosion.
Option C:	Positive pressure exists in furnace
Option D:	To maintain temperature inside furnace
Q7.	The process of heating a liquid mixture to form vapors and then cooling the vapors to get pure component is called _____
Option A:	Crystallization
Option B:	Distillation
Option C:	Chromatography
Option D:	Sublimation
Q8.	More volatile component in feed mixture has....
Option A:	Low boiling point so it evaporates slower
Option B:	High boiling point so it evaporates faster
Option C:	Low boiling point so it evaporates faster
Option D:	High boiling point so it evaporates slower
Q9.	Intrinsic safety is a technique used to _____
Option A:	Prevent Explosions due to sparking of electrical apparatus in hazardous areas.
Option B:	Prevent Failure of instruments due to sparking of electrical apparatus.
Option C:	Prevent Explosions due to fire of apparatus in Nonhazardous areas.
Option D:	Prevent fire due to chemicals in hazardous areas.
Q10.	Attemperator used in boiler steam temperature control, it serve the purpose of .....
Option A:	Sprinkling water/coolant in stream of steam
Option B:	Adding heat in steam
Option C:	Increasing steam flow rate
Option D:	Diverting steam flow
<b>Q2 .A</b>	<b>Solve any Four Questions out of Six</b> <b>05 marks each</b>



1	Explain the Thermal runaway process in the reactor
2	Draw distillation column and explain different packaging structure used in it.
3	Explain Shrink and Swell Phenomena in boiler
4	Explain Bypass Control in heat exchanger
5	Explain Crystallization curve along with its process.
6	Draw and explain drying curve.
<b>Q3.</b>	<b>Solve any Two Questions out of Three      10 marks each</b>
1.	Explain Startup Heater control scheme for furnace
2.	Explain top product composition control in the distillation column
3.	What is hazardous area? Explain fire triangle? what is intrinsic safety in hazardous area.
<b>Q3.</b>	<b>Solve any Two Questions out of Three      10 marks each</b>
1.	Draw and Explain Process flow diagram of Typical Iron and steel industry. State major instruments used in the manufacturing of steel.
2.	Explain atmospheric tray dryer.
3.	Explain Cascade Control scheme in single effect evaporator.

**Examination First Half 2022 under cluster \_\_ (Lead College: \_\_\_\_\_)****Examinations Commencing from May 2022****Program: Instrumentation Engineering****Curriculum Scheme: R-2019 'C'****Examination: TE Semester VI****Course Code: ISC602 and Course Name: Digital Signal Processing****Time: 2.30 Hr.****Max. Marks: 80**

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Which of the following should be done to convert a continuous-time signal to a discrete-time signal?
Option A:	Sampling
Option B:	Differentiating
Option C:	Integrating
Option D:	Delaying
2.	The DFT of the sequence $x(n) = \{1, 2, 1, 0\}$ is
Option A:	$X(k) = \{3, 0, j, 4\}$
Option B:	$X(k) = \{0, -1, 6, -j\}$
Option C:	$X(k) = \{5, j, -j, 7\}$
Option D:	$X(k) = \{4, -j2, 0, j2\}$
3.	Which systems is time invariant?
Option A:	$y(t) = x(2t) + x(t)$
Option B:	$y(t) = x(t) + x(1-t)$
Option C:	$y(t) = x(t) + x(t-1)$
Option D:	$y(t) = -x(t) + x(1-t)$
4.	The linear convolution of $x(n) = \{1, -1, 2, -2, 3, -3, 4, -4\}$ and $h(n) = \{-1, 1\}$
Option A:	$y(n) = \{-1, 2, -3, 4, -5, 6, -7, 8, -4\}$
Option B:	$y(n) = \{-1, 2, -3, 4, -5, 6, 7, 8, -4\}$
Option C:	$y(n) = \{-1, 2, -3, 4, -5, 6, 7, 8, 4\}$
Option D:	$y(n) = \{-1, 2, 3, 4, -5, 6, 7, 8, -4\}$
5.	The fourier transform of $x(n) = (0.8)^n$ ; $n=0, \pm 1, \pm 2, \dots$ is
Option A:	Does not exist
Option B:	$1/(1-0.8e^{j\omega})$
Option C:	$0.8/(1-0.8e^{j\omega})$
Option D:	$0.8e^{j\omega}/(1-0.8e^{j\omega})$
6.	Which window spectrum has the highest attenuation for side lobes
Option A:	Bartlett window
Option B:	Blackman window
Option C:	Hanning window
Option D:	Hamming window
7.	What is the Butterworth polynomial of order 3 ?
Option A:	$(s^2+s+1)(s-1)$



Option B:	$(s^2-s+1)(s-1)$
Option C:	$(s^2-s+1)(s+1)$
Option D:	$(s^2+s+1)(s+1)$
8.	The IIR filter designing involves
Option A:	Designing of analog filter in analog domain and transforming into digital domain
Option B:	Designing of analog filter in digital domain and transforming into analog domain
Option C:	Designing of digital filter in digital domain and transforming into analog domain.
Option D:	Designing of digital filter in analog domain and transforming into digital domain
9.	Which of the following is not used in the realization of a system?
Option A:	Delay elements
Option B:	Multipliers
Option C:	Adders
Option D:	Divider
10.	What is the peak side lobe (in dB) for a Blackmann window
Option A:	-25
Option B:	-58
Option C:	-41
Option D:	-31

<b>Q2 (20 Marks Each)</b>	
<b>A</b>	<b>Solve any Two 5 marks each</b>
i.	Explain the basic elements of DSP
ii.	Find whether the signal is periodic or not. if periodic find the fundamental period $x(n) = \cos\left(\frac{5\pi}{9}n + 1\right)$
iii.	Explain any one property of Discrete time fourier series
<b>B</b>	<b>Solve any One 10 marks each</b>
i.	Find 8-point DFT of the given sequence using DIT-FFT $X(n) = \{1, 2, 3, 4, 5, 6, 7, 8\}$
ii.	Design a linear phase FIR lowpass filter using rectangular window, by taking 7 samples of window sequence and with a cutoff frequency $\omega_c = 0.2\pi$ rad/sample

<b>Q3</b> <b>(20 Marks Each)</b>	<b>Solve any Two Questions out of Three</b> <b>10 marks each</b>
A	Perform circular convolution using DFT/IDFT $X(n)=\{3 \ 5 \ 1 \ 2\}$ $h(n)=\{7 \ 1 \ 8 \ 2\}$
B	Determine the fourier transform of the signal $x(n)=a^{ n }$ where $-1 < a < 1$
C	Find the direct form-I and direct form II realization of a discrete time system represented by transfer function $H(z) = \frac{2z^3 - 4z^2 + 11z - 8}{(z - 8)(z^2 - z + 3)}$

<b>Q4</b> <b>(20 Marks Each)</b>	
A	<b>Solve any Two</b> <b>5 marks each</b>
i.	For the analog transfer function $H(s) = \frac{2s}{(s^2 + 0.2 + 1)}$ Determine $H(z)$ using Bilinear transformation if a) $T=1$ sec
ii.	Comparison of IIR and FIR filters
iii.	Explain any one application of DSP
B	<b>Solve any One</b> <b>10 marks each</b>
i.	Determine the impulse response $h(n)$ for the system described by the second-order difference equation, $y(n) + 4y(n-1) + 3y(n-2) = x(n-1).$
ii.	Design a Butterworth digital IIR low pass filter using bilinear transformation by taking $T=0.1$ seconds, to satisfy the following specification $0.6 \leq  H(e^{jw})  \leq 1.0 \quad \text{for } 0 \leq w \leq 0.35\pi$ $ H(e^{jw})  \leq 0.1 \quad \text{for } 0.7\pi \leq w \leq \pi$



**University of Mumbai**  
**Examinations Summer-2022**

Program No. & Name of the Examination: 1T01336 // T.E. (Instrumentation Engineering)  
(SEMVI) (Choice Base Credit Grading System) (R2019) C Scheme

Subject (Paper Code): 89403 /Industrial Data Communication

Time: 2-hour 30 minutes

Paper code 91196

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	A Carrier is modulated to a depth of 40%. The percentage increased in the transmitted power is
Option A:	40%
Option B:	20%
Option C:	80%
Option D:	8%
2.	Which layer is responsible for Routing in OSI Model?
Option A:	Network
Option B:	Application
Option C:	Physical
Option D:	Session
3.	ICMP Stands for
Option A:	Internet Control Message Protocol
Option B:	Internal Control Message Protocol
Option C:	Internet Cipher Message Protocol
Option D:	Internet Communication Message Protocol
4.	The HART protocol was designed for
Option A:	Home Automation Networking
Option B:	Networked Smart Field Devices
Option C:	Vehicular Networking
Option D:	Safety applications
5.	A PID block is an example of a
Option A:	Resource Block
Option B:	Junction Box
Option C:	Function Block
Option D:	Transducer Block
6.	ZigBee networks are secured by..
Option A:	128 bit symmetric encryption keys
Option B:	Long battery life
Option C:	Secure networking
Option D:	Integration
7.	In Manchester encoding, bit 0 is represented by

Option A:	A High to Low Transition
Option B:	A Low to High Transition
Option C:	+5v
Option D:	0v
8.	In HART multidrop mode of communication, maximum number of field devices that can be connected in parallel to a single wire pair are
Option A:	15
Option B:	30
Option C:	32
Option D:	253
9.	What is IoT?
Option A:	Network of physical objects embedded with sensors
Option B:	Network of virtual objects
Option C:	Network of objects in the ring structure
Option D:	Network of sensors
10.	Uplink and downlink frequencies are related to
Option A:	Satellites
Option B:	Wireless LAN
Option C:	Ethernet
Option D:	Wi-Fi

<b>Q2.</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Explain Different modulation methods with Examples	
B	Explain Repeater, Switch, Hub, Router and Gateways with working.	
C	Explain the difference between RS-232, RS-422 and RS-485.	

<b>Q3.</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Explain the HART Protocol and give its importance in predictive maintenance.	
B	What is Profibus? Explain Profibus PA, Profibus DP and Profibus FMS.	
C	Explain IOT and IIOT in details	

<b>Q4.</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Explain the architecture of Foundation Fieldbus with Advantages and Disadvantages.	
B	Compare Wi-Fi, GPS and GPRS.	
C	Write a short note on GPIB bus and MODBUS	



<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	An example of biosensor, urea electrode makes use of which of the following electrodes?
Option A:	Carbon dioxide electrode
Option B:	Chloride electrode
Option C:	Fluoride electrode
Option D:	Ammonium electrode
2.	What is largely responsible for the negative resting membrane potential (around - 70 mV) in a neuron?
Option A:	Axonal insulation by Schwann cells.
Option B:	Voltage-gated sodium channels opening.
Option C:	The action potential.
Option D:	Potassium leak currents.
3.	Which of the following is the physio-chemical component?
Option A:	Enzymes
Option B:	Anti-bodies
Option C:	Transducer
Option D:	Cells or tissues
4.	A strain gauge is a passive transducer and is employed for converting
Option A:	Mechanical displacement into a change of resistance
Option B:	Temperature into a change of resistance
Option C:	Force into a displacement
Option D:	Pressure into displacement
5.	Resistance potentiometers convert mechanical displacement into
Option A:	Electrical signal
Option B:	Chemical signal
Option C:	Physical output
Option D:	Kinetic Energy
6.	A piezoelectric transducer has a
Option A:	Very low sensitivity
Option B:	low sensitivity
Option C:	high sensitivity
Option D:	zero sensitivity
7.	Electromagnetic coupling cannot be reduced by
Option A:	Shielding
Option B:	Wire twisting

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Option C:	multiple grounding
Option D:	Electromagnetic filters
8.	A membrane potential is the difference in electrical charge between
Option A:	potassium and sodium ions
Option B:	the inside and outside of the cell
Option C:	phosphoric acid and glycolipid layers
Option D:	resting and action potentials
9.	Environmental signal of biosensors are
Option A:	Transcriptional
Option B:	Metabolites and Gases
Option C:	Solids
Option D:	Liquids
10.	The principal ion that is not involved with the phenomena of producing cell potentials is
Option A:	Potassium
Option B:	Sodium
Option C:	Chlorine
Option D:	Hydrogen
<b>Q2</b>	<b>Solve any Two Questions out of Three</b> <b>10 marks each</b>
A	Sketch the waveform for generation of bio potential and describe its stages.
B	What are different sources of noise? Describe techniques for reduction of noise.
C	Elaborate the following with neat sketch i) Clark electrode ii) Enzyme electrode
<b>Q3.</b>	<b>Solve any Two Questions out of Three</b> <b>10 marks each</b>
A	Examine the function of electrode-electrolyte interface with suitable diagram.
B	Explain the working principle and applications of i) Immuno sensor ii) Liquid and solid Ion exchange membrane electrode
C	Illustrate the principle of optical fiber-based temperature sensor. What are the advantages of optical fiber sensors over other types of sensors?
<b>Q4.</b>	<b>Solve any Two Questions out of Three</b> <b>10 marks each</b>
A	Describe elements of biosensor with a neat diagram. Explain the application of biosensors.
B	Classify chemical sensors and explain the principle and application of catalytic and Chemiluminescence-based biosensors.
C	What are different signal processing techniques used for bio-Signals. Explain any two signal processing techniques.



Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	What is DBMS?
Option A:	DBMS is a collection of queries
Option B:	DBMS is a high-level language
Option C:	DBMS is a programming language
Option D:	DBMS stores, modifies and retrieves data
2.	Column header is refer as
Option A:	Table
Option B:	Relation
Option C:	Attributes
Option D:	Domain
3.	_____ is a hardware component that is most important for the operation of a database management system.
Option A:	Microphone
Option B:	High speed, large capacity disk to store data
Option C:	High-resolution video display
Option D:	Printer
4.	In mathematical term Table is referred as
Option A:	Relation
Option B:	Attribute
Option C:	Tuple
Option D:	Domain
5.	Rectangles in ER diagram represents,
Option A:	Tables
Option B:	Attributes
Option C:	Tuples
Option D:	Entity Sets
6.	Set of permitted values of each attribute is called
Option A:	Domain
Option B:	Tuple
Option C:	Relation
Option D:	Schema
7.	Which of the following command is used to change data in table?
Option A:	INSERT
Option B:	UPDATE
Option C:	MERGE
Option D:	ADD
8.	A command to remove a relation from an SQL database
Option A:	Delete table <table name>
Option B:	Drop table <table name>

Option C:	Erase table <table name>
Option D:	Alter table <table name>
9.	_____ indicates the maximum number of entities that can be involved in a relationship.
Option A:	Greater Entity Count
Option B:	Minimum cardinality
Option C:	Maximum cardinality
Option D:	ERD
10.	SQL stands for,
Option A:	Structured Query Language
Option B:	Sequential Query Language
Option C:	Structured Question Language
Option D:	Sequential Question Language

<b>Q2.</b> <b>(20 Marks)</b>	<b>Solve following questions</b>
A	<b>Solve any Two questions out of Three</b> <b>5 marks each</b>
i.	Give differentiate between file system and database system with an example.
ii.	Explain the ACID properties of transactions.
iii.	Draw an EER diagram for banking enterprise.
B	<b>Solve any One out of Two</b> <b>10 marks each</b>
i.	Explain the architecture of DBMS with diagram.
ii.	What is meant by mapping cardinalities? For a binary relationship set what are the possible mapping cardinalities? Illustrate with diagrams.

<b>Q3.</b> <b>(20 Marks)</b>	<b>Solve following questions</b>
A	<b>Solve any Two questions out of Three</b> <b>5 marks each</b>
i.	Design a table in 1NF, 2NF and 3NF with suitable examples.
ii.	List out various types of attributes with suitable examples.
iii.	Discuss responsibilities of DB administrator.
B	<b>Solve any One out of Two</b> <b>10 marks each</b>
i.	Explain various issues in query processing.
ii.	Construct an EER diagram and convert into Relational Model for a library Management System. Specify 2 complex SQL queries on the above-one using Group by clause and the other using Join operation with an example.

<b>Q4.</b> <b>(20 Marks)</b>	<b>Solve following questions</b>
A	<b>Solve any Two questions out of Three</b> <b>5 marks each</b>
i.	Discuss aggregate functions in the view of with suitable example
ii.	Enlist fundamental operations of relational algebra with example.
iii.	Explain conflict serializable schedule in detail.
B	<b>Solve any One out of Two</b> <b>10 marks each</b>
i.	Define deadlock. Explain methods to handle deadlock.
ii.	Write a short note on query optimization.