

**University of Mumbai**

**Examination 2020 under cluster 4 (Lead College: Pillai College of Engineering)**

Examinations Commencing from 15<sup>th</sup> June 2021 to 26<sup>th</sup> June 2021

Program: Computer Engineering

Curriculum Scheme: Rev2012

Examination: BE Semester VII

Course Code: CPC701 and Course Name: Digital Signal Processing

Time: 2 hour

Max. Marks: 80

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<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks ( 2 marks each)</b>
1.	One dimensional signal is a function of
Option A:	Multiple independent variables
Option B:	Single independent variable
Option C:	Multiple dependent variables
Option D:	Single dependent variable
2.	For $x(n) = \{ 1,2,3,5 \}$ , what will be the value at origin after performing $x(n+1)$
Option A:	2
Option B:	1
Option C:	3
Option D:	5
3.	Find the fundamental period of the signal $x(n) = \sin(0.02\pi n)$
Option A:	10
Option B:	100
Option C:	50
Option D:	25
4.	A signal is a power signal if
Option A:	$P = \text{finite}, E = 0$
Option B:	$P = \text{finite}, E = \text{finite}$
Option C:	$P = \text{finite}, E = \text{Infinity}$
Option D:	$P = \text{Infinity}, E = \text{Infinity}$
5.	Determine the energy of signal $x(n) = u(n) - u(n-6)$
Option A:	4
Option B:	8
Option C:	10
Option D:	6
6.	Identify a non-causal system from the following
Option A:	$y(n) = n x(n)$
Option B:	$y(n) = x(n) + x(n+2)$
Option C:	$y(n) = x(n-2) + x(n-1)$
Option D:	$y(n) = x(n) + x(n-2)$
7.	An LTI system is one which satisfies the properties of

Option A:	Linearity, Time invariance
Option B:	Non linearity , Time invariance
Option C:	Linearity , Time variance
Option D:	Non linearity , Time variance
8.	For a discrete time to be stable its impulse response
Option A:	Should be absolutely summable
Option B:	Need not be absolutely summable
Option C:	Can be infinite
Option D:	Can be zero
9.	DFT of circular convolution of $x_1(n)$ and $x_2(n)$ is
Option A:	1
Option B:	0
Option C:	infinity
Option D:	$X(k)X(k)$
10.	DFT of $x(n)=\{1,0,1,0\}$ is
Option A:	$X(k)=\{2,0,2,0\}$
Option B:	$X(k)=\{2,2,2,2\}$
Option C:	$X(k)=\{2,0,0,0\}$
Option D:	$X(K)=\{2,1,1,1\}$
11.	IDFT of $X(k)=\{4,0,0,0\}$
Option A:	$x(n)=\{1,0,0,0\}$
Option B:	$x(n)=\{1,1,1,1\}$
Option C:	$x(n)=\{1,0,1,0\}$
Option D:	$x(n)=\{0,1,0,1\}$
12.	For a radix -2 FFT, N must be a power of
Option A:	N
Option B:	4
Option C:	2
Option D:	N/2
13.	The number of complex multiplications involved in the direct computation of 8-point DFT is
Option A:	8
Option B:	64
Option C:	16
Option D:	56
14.	The computation of 32-point DFT by radix-2 DIT-FFT involves _____ stages of computation
Option A:	3
Option B:	4
Option C:	5
Option D:	6

15.	Method of convolution of two sequences when one sequence is much larger than the other is
Option A:	Circular convolution method
Option B:	Overlap add method
Option C:	Cross correlation method
Option D:	Auto correlation method
16.	Let length of input sequence be L and impulse response be M, then the length of input sequence block in overlap save method is
Option A:	L+M-1
Option B:	L+M
Option C:	L+M+1
Option D:	L-M+1
17.	The Nyquist rate and Nyquist interval of $\sin(2\pi t)$ is
Option A:	2Hz, 0.5 sec
Option B:	0.5Hz, 2 sec
Option C:	1 Hz, 0.5sec
Option D:	1.5 Hz, 1 sec
18.	FFT computation is faster than DFT because it utilizes the following properties
Option A:	Convolution
Option B:	Linearity
Option C:	Time reversal
Option D:	Periodicity and Symmetry
19.	TMS320C5X is a ----- bit, fixed point processor
Option A:	8
Option B:	16
Option C:	32
Option D:	64
20.	Analog speech signal can be converted to digital speech signal using
Option A:	Sampling
Option B:	Sampling, Quantization and Coding
Option C:	Coding
Option D:	Quantization

<b>Q2.</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Determine the response of the system for the input $x(n) = \{0,1,2,3\}$ and impulse response $h(n) = \{2,1,1,2\}$ .	
B	If $x(n) = \{1, -2, 2, 3\}$ and $h(n) = \{2,1, 1\}$ Determine linear convolution using circular convolution	
C	Classify whether $y(n)=n x(n)$ is 1. Causal/Non causal 2. Linear / Non linear 3. Time variant/Time invariant	
D	Verify Parseval's theorem for $X(k)=\{10, -2+2j, -2, -2-2j\}$ using DFT properties	
E	Determine cross correlation of $x(n)=\{8,9,2,3\}$ and $y(n)= \{4,3,6\}$	
F	Compare microprocessor with Digital signal processor	

<b>Q3.</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Discuss about any 5 properties of DFT.	
B	Compute DFT of $x(n) = \{0,1,2,1\}$ using Radix - 2 DIT FFT. Draw the flow graph.	
C	Perform linear convolution of $x(n)= \{4,4,3,3,2,2,1,1\}$ and $h(n)= \{-1,1\}$ using overlap add method .	



5.	Find stability criteria $h(n) = (5)^n u(-n)$
Option A:	Stable, $h(n)=1.25$
Option B:	Unstable, $h(n)=1.25$
Option C:	Unstable, $\infty$
Option D:	Stable, 0
6.	Obtain Autocorrelation of the given signal $x(n) = \begin{matrix} 4 & 3 & 2 \\ & & \uparrow \end{matrix}$
Option A:	$\begin{matrix} 8 & 18 & 29 & 18 & 8 \\ & & & \uparrow & \end{matrix}$
Option B:	$\begin{matrix} 8 & 18 & 29 & 18 & 8 \\ & & \uparrow & & \end{matrix}$
Option C:	$\begin{matrix} 29 & 18 & 8 & 18 & 8 \\ & & & \uparrow & \end{matrix}$
Option D:	$\begin{matrix} 29 & 8 & 18 & 8 & 18 \\ & & & \uparrow & \end{matrix}$
7.	Which of the following statement is true for FFT & DFT
Option A:	FFT is time domain and DFT is frequency domain.
Option B:	Results of FFT and DFT are same in magnitude but phase is different.
Option C:	Results of FFT and DFT are same in phase but different in magnitude.
Option D:	Results of FFT and DFT are same, FFT is more efficient than DFT.
8.	DTFT of a impulse signal is
Option A:	$\infty$
Option B:	0
Option C:	1
Option D:	-1
9.	Let $x(n)=\{ 0,1,2,3,2,3,5,3\}$ With 8 Point DFT, evaluate $X[0]$ & $X[4]$ without computing DFT.
Option A:	$X[0]= 19, X[4]=0$
Option B:	$X[0]= 0, X[4]=19$
Option C:	$X[0]= 19, X[4]=-1$

Option D:	X[0]= -1, X[4]=19
10.	For a given analog signal $x(t) = 2\sin(480\pi t) + 3\sin(120\pi t)$ What is the minimum sampling rate to avoid aliasing
Option A:	240Hz
Option B:	60Hz
Option C:	300Hz
Option D:	480Hz
11.	Determine X[0] & X[2] For five point DFT $X[k]=\{15, ?, -2.5+0.81j, ?, -2.5-3.44j\}$ Determine X[1] & X[3]
Option A:	X[1]= -2.5-3.44j    X[3]= -2.5+0.81j
Option B:	X[1] = X[3]=-2.5+0.81j
Option C:	X[1] = X[3] = -2.5+3.44j
Option D:	X[1]= -2.5+3.44j    X[3]= -2.5-0.81j
12.	Which file format uses DCT as a main method
Option A:	BMP
Option B:	TIFF
Option C:	JPEG
Option D:	PDF
13.	Decreasing spatial resolution of a digital image within the same area results in
Option A:	Log transformation
Option B:	False contouring
Option C:	Checkerboard Pattern
Option D:	Power law transformation
14.	In contrast stretching, is it possible to i) make darker portion more darker ii) make darker portion brighter
Option A:	Yes, No
Option B:	No, Yes

Option C:	No, No
Option D:	Yes, Yes
15.	Which operator is used to expand low value pixels and compresses high value pixels.
Option A:	Log
Option B:	Exponential
Option C:	Slope
Option D:	CDF
16.	In the digital image of M rows and N columns and L discrete gray levels, calculate the bits required to store a digitized image for M=N=8 and L=4.
Option A:	64
Option B:	128
<b>Option C:</b>	<b>32</b>
Option D:	16
17.	Can we generate image from its histogram.
Option A:	Yes
Option B:	No
Option C:	Depends on tonal resolution
Option D:	Depends on gray level resolution
18.	What happen if max filter is used instead of median filter to remove salt & pepper noise.
Option A:	Enhance pepper noise
Option B:	Remove gaussian if exist
Option C:	Enhance salt noise
Option D:	Same effect as median filter
19.	The edges and other abrupt changes in gray-level of an image are associated with
Option A:	High frequency components
Option B:	Low frequency components
Option C:	Edges with high frequency and other abrupt changes in gray-level with low frequency components
Option D:	Edges with low frequency and other abrupt changes in gray-level with high frequency components
20.	Does Sobel & Prewitt edge detection operators performs smoothing while



	<p>equalized histogram.</p> <table border="1"> <tr> <td>Gray Level</td> <td>0</td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td>No. of Pixels</td> <td>790</td> <td>1023</td> <td>850</td> <td>656</td> <td>329</td> <td>245</td> <td>122</td> <td>81</td> </tr> </table>	Gray Level	0	1	2	3	4	5	6	7	No. of Pixels	790	1023	850	656	329	245	122	81
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No. of Pixels	790	1023	850	656	329	245	122	81											
E	<p>For given 3 bits per pixel , 4×4 size image perform following operations.</p> <p>i) Thresholding <math>T=3</math></p> <p>ii) Intensity level slicing with background <math>r_1= 3</math> &amp; <math>r_2= 5</math></p> <p>iii) Bit plane slicing for MSB and LSB plan</p> <p>iv) Digital negative</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td><b>3</b></td> <td><b>3</b></td> <td><b>1</b></td> <td><b>2</b></td> </tr> <tr> <td><b>1</b></td> <td><b>4</b></td> <td><b>0</b></td> <td><b>7</b></td> </tr> <tr> <td><b>3</b></td> <td><b>4</b></td> <td><b>2</b></td> <td><b>6</b></td> </tr> <tr> <td><b>2</b></td> <td><b>4</b></td> <td><b>6</b></td> <td><b>4</b></td> </tr> </table>	<b>3</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>7</b>	<b>3</b>	<b>4</b>	<b>2</b>	<b>6</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>4</b>		
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F	<p>Define segmentation. Explain Image Segmentation based on Discontinuities in detail?</p>																		

## University of Mumbai

### Examination 2020 under cluster 4 (Lead College: Pillai College of Engineering)

Examinations Commencing from 15<sup>th</sup> June 2021 to 26<sup>th</sup> June 2021

Program: Computer Engineering

Curriculum Scheme: Rev2012

Examination: BE Semester VII

Course Code: CPC 702 and Course Name: Cryptography and System Security

Time: 2 hour

Max. Marks: 80

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	-----makes relationship between ciphertext and key as complex as possible
Option A:	Confusion
Option B:	Diffusion
Option C:	Hashing
Option D:	Authentication
2.	-----Used to protect blocks of data, such as messages, from alteration.
Option A:	Data integrity algorithms
Option B:	Asymmetric encryption
Option C:	Asymmetric encryption
Option D:	Authentication protocols
3.	-----involves the passive capture of a data unit and its subsequent retransmission to produce an unauthorized effect
Option A:	Replay
Option B:	Masquerade
Option C:	Modification of Message
Option D:	Denial of Service
4.	-----is not a specific security mechanism.
Option A:	Encipherment
Option B:	Digital Signature
Option C:	Event Detection
Option D:	Access Control
5.	The encrypted message “meet me after the toga party” with a rail fence of depth 2 is
Option A:	METHEPARTYMEETAFTERTOGA
Option B:	MEETAFTERTOGAMETHEPARTY
Option C:	MEETMEAFETERHETOGAPARTY
Option D:	MEMATRHTGPRYETEFETEOAAT
6.	Apply Caesar cipher technique to encrypt the message “meet me after the toga party”
Option A:	cipher: PHHW PH DIWHU WKH WRJD SDUWB
Option B:	cipher: QIIX QI EJXIV XLI XSKE TEVXC

Option C:	cipher: OGGV OG CHVGT VJG VQIC RCTVA
Option D:	cipher: PHHW OG DIWHU WKH TEVXC
7.	The number of substitution boxes in DES after the 48 bit XOR operations are
Option A:	7
Option B:	8
Option C:	6
Option D:	9
8.	A desirable property of any encryption algorithm is that a small change in either the plaintext or the key should produce a significant change in the ciphertext.
Option A:	Reversible mapping
Option B:	Feistel Structure
Option C:	Round Function
Option D:	Avalanche Effect
9.	IDEA word in IDEA algorithm is abbreviation of
Option A:	International Data Encryption Algorithm
Option B:	International Decryption Encryption Algorithm
Option C:	Integrated Data Encrypting Algorithm
Option D:	Integrated Decrypting Encrypting Algorithm
10.	Which of the following is not an application of hash function?
Option A:	Password verification
Option B:	Integrity checking of data
Option C:	Encoding and decoding of data
Option D:	Digital signature
11.	Alice digitally signs a message and send it to Bob. Verification of the signature by bob requires
Option A:	Alice's private key
Option B:	Alice's public key
Option C:	Bob's private key
Option D:	Bob's public key
12.	Which of the following property is not true with respect to Message Authentication code (MAC)?
Option A:	It is one to many function
Option B:	It condenses variable length message
Option C:	It uses secret key
Option D:	It is fixed size authenticator
13.	Which of the following algorithm is used in DSS signature?
Option A:	MD4
Option B:	MD5
Option C:	SHA1
Option D:	SHA2

14.	Suppose that Alice has obtained a certificate from certification authority CA1 and Bob has obtained certificate authority from CA2. Alice can use a chain of certificates to obtain Bob's public key. which of the following is the correct order of chain used in X.509?
Option A:	CA2 CA1 CA1 Bob
Option B:	CA1 CA1 CA2 Alice
Option C:	CA1 CA2 CA2 Bob
Option D:	CA1 CA2 CA2 Alice
15.	Intrusion detection is the process of detecting actions that attempts to compromise confidentiality, integrity and _____.
Option A:	Availability
Option B:	Authenticity
Option C:	Non-repudiation
Option D:	Anonymity
16.	Which of the following firewall works at layer 3, 4, 5, and 7?
Option A:	Packet filter
Option B:	Application proxy
Option C:	Personal firewall
Option D:	Stateful inspection
17.	What is privilege escalation?
Option A:	Creating a user account with higher privileges
Option B:	Creating a user account with Administrator privileges
Option C:	Creating two user account one with high privileges and one with lower privileges
Option D:	Increasing privileges on a user account
18.	Which of the following turn out to be best mechanism for memory and address protection?
Option A:	Fencing
Option B:	Relocation
Option C:	Segmentation
Option D:	Paging
19.	Following is not a characteristic of Virus?
Option A:	Viruses destroy and modify user data
Option B:	Virus is a standalone malicious program
Option C:	Virus is a code embedded in a legitimate program
Option D:	Virus is always activated by some event
20.	In SSL protocol, the maximum length of each fragment after encryption is
Option A:	214+1028
Option B:	214+2048
Option C:	216+1028
Option D:	216+2048

<b>Q2</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	What are the key Principles of Security?	
B	Explain with examples, keyed and keyless transposition ciphers.	
C	Compare packet sniffing and packet spoofing.	
D	What is Buffer overflow and incomplete mediation in software security?	
E	Write short notes on Intrusion Detection Systems.	
F	Differentiate between MD5 and SHA.	

<b>Q3</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Explain working of DES detailing the Feistel structure.	
B	Explain Kerberos systems that support authentication in distributed systems.	
C	A and B decide to use Diffie Hellman algorithm to share a key. They chose $p=23$ and $g=5$ as the public parameters. Their secret keys are 6 and 15 respectively. Compute the shared key that they share.	

**University of Mumbai**  
**Examination 2020 under cluster 4 (Lead College: PCE, New Panvel)**  
**Examinations Commencing from 15<sup>th</sup> June 2021 to 26<sup>th</sup> June2021**

Program: **Computer Engineering**

Curriculum Scheme: Rev2016

Examination: FE/SE/TE/BE Semester VII

Course Code: CSC702 and Course Name: Mobile Communication & Computing

Time: 2 hour

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	Which multiple access technique is used by IEEE 802.11 standard for wireless LAN?
Option A:	ALOHA
Option B:	CDMA
Option C:	MACA
Option D:	TDMA
2.	_____ is a wireless routing protocol.
Option A:	RIP
Option B:	BGP
Option C:	DSDV
Option D:	DSR
3.	One of the step of agent discovery in mobile IP is
Option A:	Agent registration
Option B:	Agent Advertisement
Option C:	Tunneling
Option D:	Binding warning
4.	I-TCP and Snooping TCP does not help much if a mobile host gets
Option A:	Disconnected
Option B:	Out of coverage area
Option C:	Battery power low
Option D:	Mobile hosts are not in same area
5.	VLR and HLR in GSM systems are
Option A:	Gateways for outer connectivity
Option B:	Routers and call management servers
Option C:	Databases of registered users
Option D:	Database for maintaining track of stolen devices
6.	Which of the following component in LTE is acting as a router and forwards data between base station and PDN Gateway?
Option A:	MME
Option B:	ENodeB
Option C:	PGW
Option D:	SGW

7.	The main function of snooping TCP is
Option A:	Flow Control
Option B:	Splits TCP into two connections
Option C:	Congestion Control
Option D:	To buffer data close to the mobile host to perform fast local retransmission in case of packet loss.
8.	A UMTS (Universal Mobile Telecommunication) network is a ___ network.
Option A:	Fourth Generation
Option B:	Second Generation
Option C:	Third Generation
Option D:	First Generation
9.	In case of SON-LTE which of the following is not true?
Option A:	eNodeB configuration is done by itself
Option B:	Manual configuration is needed
Option C:	It is self-organizing
Option D:	It is like Plug and Play
10.	_____ is a procedure the network uses to find out a subscriber's location before actual call establishment.
Option A:	Handover
Option B:	Spread spectrum
Option C:	paging
Option D:	Channel selection
11.	Which of the following is not a component of high level network architecture of LTE?
Option A:	UTRAN
Option B:	EPC
Option C:	MSC
Option D:	UE
12.	Each TDM channel occupies the _____ carrier for 577 $\mu$ s in every 4.615ms.
Option A:	400 KHz.
Option B:	200 MHz.
Option C:	200 KHz.
Option D:	800 KHz.
13.	Which of the following spread spectrum techniques were used in the original IEEE 802.11 standard?
Option A:	THSS and DSSS
Option B:	THSS and FHSS
Option C:	CDMA and TDMA
Option D:	FHSS and DSSS
14.	Which of the following technology does not use MIMO?
Option A:	WIMAX
Option B:	4G

Option C:	AMPS
Option D:	5G
15.	In MTC , security checks are executed between _____
Option A:	MT and BTS
Option B:	BSC and MSC
Option C:	MSC and GMSC
Option D:	VLR and MSC
16.	If Mobile Node is in foreign network, to whom it will give a registration request?
Option A:	Foreign Agent (FA)
Option B:	Home Agent (HA)
Option C:	BSC
Option D:	Correspondent Node
17.	_____ in GPRS is used for mobility management.
Option A:	GGSN
Option B:	SGSN
Option C:	PCU
Option D:	BSS
18.	In case of HetNet which of the following is not true?
Option A:	Cells are of same type
Option B:	It uses mix radio technology
Option C:	WiFi working is seamless
Option D:	Cells are of different type
19.	Uplink frequency range in GSM network is
Option A:	935-960 MHZ
Option B:	890-915 MHZ
Option C:	800-950 MHZ
Option D:	810-915 MHZ
20.	Permanent subscriber information in maintained in _____
Option A:	HLR
Option B:	VLR
Option C:	EIR
Option D:	AUC

<b>Q2</b> <b>(20 Marks)</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Explain how to calculate nearest co- channel cell in cellular system.	
B	List out some advantages of Mobile Computing.	
C	Why the traditional IP cannot be used in a mobile network. What are the main differences between the traditional IP and the mobile IP?	
D	Difference between LTE and LTE-Advanced.	
E	What are the functions of MSC in GSM architecture?	
F	Why is physical layer in IEEE802.11 subdivided ? What are its sublayers?	

<b>Q3.</b> <b>(20 Marks)</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Discuss the architecture of UMTS?	
B	What is triangular routing problem? How do you solve it?	
C	What is the need of Cellular IP? Explain Cellular architecture with paging.	

**University of Mumbai**  
**Examination 2020 under cluster 04 (Lead College: PCE, Panvel)**

**Examinations Commencing from 15<sup>th</sup> June 2021 to 26<sup>th</sup> June 2021**

**Program: Computer Engineering**

Curriculum Scheme: Rev 2012

Examination: BE Semester VII

Course Code: CPC703 and Course Name: Artificial Intelligence

Time: 2 hour

Max. Marks: 80

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<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	What is Artificial intelligence?
Option A:	Making a Machine intelligent
Option B:	Programming with your own intelligence
Option C:	Playing a Game
Option D:	Putting your intelligence into Computer
2.	Which of the following is not a goal of AI?
Option A:	Thinking humanly
Option B:	Adapting to the environment and situations
Option C:	To rule over humans
Option D:	Real Life Problem Solving
3.	Which of the following is not a goal of an AI agent?
Option A:	Perceiving data from the environment
Option B:	Adapting to the environment and situations
Option C:	Acting upon the Environment
Option D:	Reversing the previously performed actions
4.	Satellite Image Analysis System is
Option A:	partially Observable
Option B:	Fully Observable
Option C:	Episodic
Option D:	Single agent
5.	An agent is composed of
Option A:	Architecture
Option B:	Perception Sequence
Option C:	Architecture and Program
Option D:	Perception Sequence
6.	What is the heuristic function of A* search?
Option A:	$f(n) \neq h(n)$
Option B:	$f(n) < h(n)$
Option C:	$f(n) = g(n) + h(n)$
Option D:	$f(n) > h(n)$

7.	Which were built in such a way that humans had to supply the inputs and interpret the outputs?
Option A:	Agents
Option B:	Actuators
Option C:	Sensor
Option D:	AI system
8.	Which form is called as a conjunction of disjunction of literals?
Option A:	Conjunctive normal form
Option B:	Disjunctive normal form
Option C:	Normal form
Option D:	First normal form
9.	Which is used to construct the complex sentences?
Option A:	Symbols
Option B:	Connectives
Option C:	Logical connectives
Option D:	Preposition
10.	Which algorithm will work backward from the goal to solve a problem?
Option A:	Forward chaining
Option B:	Backward chaining
Option C:	Hill-climb algorithm
Option D:	Stimulus annealing
11.	Which function is used to calculate the feasibility of whole game tree?
Option A:	Evaluation function
Option B:	Transposition
Option C:	Alpha-beta pruning
Option D:	Gradient descent
12.	Forward chaining systems are _____ whereas backward chaining systems are _____
Option A:	Goal-driven, goal-driven
Option B:	Goal-driven, data-driven
Option C:	Data-driven, goal-driven
Option D:	Data-driven, data-driven
13.	The process by which the brain incrementally orders actions needed to complete a specific task is referred as
Option A:	Planning problem
Option B:	Partial order planning
Option C:	Total order planning
Option D:	Both Planning problem & Partial order planning
14.	Uncertainty arises in the Wumpus world because the agent's sensors give only
Option A:	Full & Global information
Option B:	Partial & Global Information
Option C:	Partial & local Information
Option D:	Full & local information

15.	Which is true for Decision theory?
Option A:	Decision Theory = Probability theory + utility theory
Option B:	Decision Theory = Inference theory + utility theory
Option C:	Decision Theory = Probability theory + preference
Option D:	Decision Theory = Uncertainty + utility theory
16.	Where does the Bayes rule can be used?
Option A:	Solving queries
Option B:	Increasing complexity
Option C:	Decreasing complexity
Option D:	Answering probabilistic query
17.	What is the consequence between a node and its predecessors while creating Bayesian network?
Option A:	Functionally dependent
Option B:	Dependent
Option C:	Conditionally independent
Option D:	Both Conditionally dependent & Dependent
18.	In which of the following learning the teacher returns reward and punishment to learner?
Option A:	Active learning
Option B:	Reinforcement learning
Option C:	Supervised learning
Option D:	Unsupervised learning
19.	Which of the following is not a components of an Expert Systems?
Option A:	Generator
Option B:	Inference Engine
Option C:	User Interface
Option D:	Knowledge Base
20.	What is the main challenges of NLP?
Option A:	Handling Ambiguity of Sentences
Option B:	Handling Tokenization
Option C:	Handling POS-Tagging
Option D:	Morphological Segmentation

<b>Q2</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Compare goal-based agent with model-based agent. Gives the PEAS for self-driven car agent. Characterized its environment	
B	<b>Consider the following facts about the dolphin</b> 1. Whoever can read is literate. Dolphins are not literate. Some dolphins are intelligent	

	1.Represent above sentence in the first order predicate logic (FOPL) 2.Convert them to clause form 3.Prove that “Some who are intelligent cannot read” using resolution technique
C	Explain partial order planning with an example.

<b>Q3.</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
1	Draw general architecture of an Expert system. Explain each component in details with an example.	
3	Apply A* algorithm on the following figure. Start node is S and goal node is G. Heuristic values are given beside node. 	
3	Give a formal definition of Bayesian Belief network (BBN). Illustrate a process of constructing a BBN with a suitable scenario. What type of inference can be drawn from BBN network.	

**University of Mumbai**

**Examination 2020 under cluster 4 (Lead College: Pillai College of Engineering)**

**Examinations Commencing from 15<sup>th</sup> June 2021 to 26<sup>th</sup> June 2021**

Program: Computer Engineering : SEM VII R2016 scheme CBCGS

Curriculum Scheme: Rev2016

Examination: BE Semester VII

Course Code: CSC703 and Course Name: Artificial Intelligence and Soft Computing

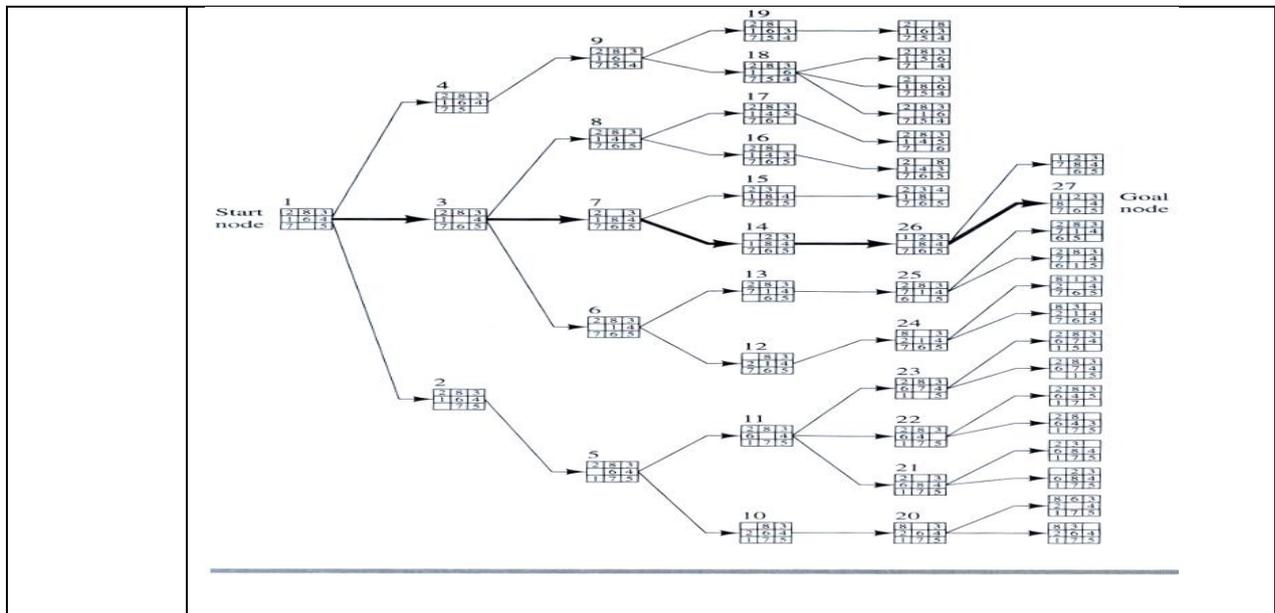
Time: 2 hour

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	Infrared or sonar sensors of an agent, automated drone acting upon the environment in dynamic and stochastic task environments is part of which PEAS description?
Option A:	Sensors
Option B:	Performance Measure
Option C:	Actuators
Option D:	Part of task environment
2.	_____ Agent deals with happy and unhappy state of performance.
Option A:	Learning Agent
Option B:	Simple reflex agent
Option C:	Model based agent
Option D:	Utility based agent
3.	_____ is the process of removing Existential quantifiers by elimination
Option A:	Skolemization
Option B:	AND Elimination
Option C:	Quantification
Option D:	Knowledge Entailment
4.	Which of the following is not a drawback of Hill Climbing Algorithm?
Option A:	Local Maxima
Option B:	Global Maxima
Option C:	Platue
Option D:	Ridge
5.	Which of the following relations hold good for fuzzy sets?
Option A:	$\mu(x)=0$ or $1$
Option B:	$\mu(x) \notin [0,1]$
Option C:	$\mu(x) \in [0,1]$
Option D:	It can take any values

6.	_____ and _____ are two kinds of fuzzy quantifiers
Option A:	Absolute and Real
Option B:	Approximate and Real
Option C:	Dummy and Real
Option D:	Precise and Real
7.	<p>Consider fuzzy set M defined on the reference set <math>U=\{a,b,c,d,e\}</math></p> $M = \frac{0.375}{a} + \frac{0.5}{c} + \frac{1.0}{d} + \frac{0.875}{e}$ <p>The Fuzzy set M has core (M) =</p>
Option A:	{a}
Option B:	{c}
Option C:	{d}
Option D:	{e}
8.	<p>Given the stages of an expert system, normally an expert system follows which order of development stages</p> <ol style="list-style-type: none"> <li>i. Develop the prototype</li> <li>ii. Design the system</li> <li>iii. Identify problem domain</li> <li>iv. Test and refine the prototype</li> </ol>
Option A:	iii ii i and iv
Option B:	i ii iii and iv
Option C:	iii ii iv and i
Option D:	iv iii ii and i
9.	Which of the below is not an application of an expert system
Option A:	DENDRAL
Option B:	MYCIN
Option C:	CaDET
Option D:	A* SEARCH
10.	<p>Observe the Image and select the linear separable dataset</p> <p>Legend: ● Class 1, ● Class 2</p>

Option A:	Fig a
Option B:	Fig b
Option C:	Fig c
Option D:	Fig d
11.	Which of the following parts of a biological neuron is modeled by the weighted interconnections between the input units and the output unit of an artificial neural model ?
Option A:	Dendrite
Option B:	Axon
Option C:	Soma
Option D:	Synapse
12.	Which of the following is not true about McCulloch Pitts neurons?
Option A:	The interconnections are unidirectional
Option B:	The excitatory interconnections have the same weight
Option C:	All inhibitory connections have the same weight
Option D:	The activation is bipolar
13.	In case of A* search technique, which of the following is not TRUE?
Option A:	A* ensures completeness property
Option B:	A* provides optimal solution to problem
Option C:	if A* has admissible heuristic function, then tree search is optimal
Option D:	It uses small memory & does not visit same node again and again
14.	When a sentence is represented as conjunction of clauses where each clause is disjunction of literals, then the form is called as
Option A:	Bilateral Normal Form
Option B:	Disjunctive Normal Form
Option C:	Clause Normal form
Option D:	Conjunctive Normal Form
15.	The definition of Artificial Intelligence "Computational Intelligence is the study of the design of intelligent agents." (Poole <i>et al.</i> , 1998), falls under which category of AI definition
Option A:	Think like humans
Option B:	Acting rationally
Option C:	Acting humanly
Option D:	Think rationally
16.	In the below figure, identify the depth of Depth First Search Limit from start to goal node?



Option A:	L=4
Option B:	L=5
Option C:	L=6
Option D:	L=7
17.	Search strategies are very essential in solving problems. The blind search strategy is one such problem-solving strategy which is also called as
Option A:	Dynamic search strategy
Option B:	Uniform search strategy
Option C:	Uninformed search strategy
Option D:	Informed search strategy
18.	_____ is used to improve the performance of heuristic search.
Option A:	Quality of nodes
Option B:	Quality of heuristic function
Option C:	Simple nodes
Option D:	Nothing helps, search is very uncertain
19.	Which of the following is not a component of formulating a problem?
Option A:	Path cost
Option B:	Goal test
Option C:	Cost test
Option D:	Transition model
20.	A partial order planner can generate various solution sequences through different combinations of subsequence solutions. Each of this final solution is called as _____
Option A:	Linearization of the partial order plan
Option B:	Partial order solution
Option C:	Total order solution
Option D:	Order solution

## Descriptive questions

<p><b>Q2.</b> (20 Marks)</p>	<p>Solve any Four out of Six- 5 marks each</p>
<p>A</p>	<div style="text-align: center;"> <pre> graph TD     A((A)) --- B((B))     A --- C((C))     B --- D((D))     B --- E((E))     D --- H((H))     D --- I((I))     E --- J((J))     C --- F((F))     C --- G((G))     F --- K((K))             </pre> </div> <p>Apply IDFS algorithm for the above search tree considering A as start node and G as goal node. Note down the drawback of this algorithm.</p>
<p>B</p>	<p>Consider the below facts</p> <p>Salman likes all kinds of food Apples are food Chicken is food</p> <p>Anything anyone eats and is not killed by is food Bill eats peanuts and is still alive Susie eats anything bill eats.</p> <p>Prove that Salman likes peanuts using backward chaining tree.</p>
<p>C</p>	<p>The wumpus world is a cave consisting of rooms connected by passageways. Lurking somewhere in the cave is the wumpus, a beast that eats anyone who enters its room. The wumpus can be shot by an agent, but the agent has only one arrow. Some rooms contain bottomless pits that will trap anyone who wanders into these rooms (except for the wumpus, which is too big to fall in). The only mitigating feature of living in this environment is the possibility of finding a heap of gold. Although the wumpus world is rather tame by modern computer game standards, it makes an excellent test bed environment for intelligent agents.</p> <p>Give PEAS description for the above agent.</p>
<p>D</p>	<p>The vacuum-cleaner agent is so simple that we can describe everything that happens; it's also a made-up world, so we can invent many variations. This particular world has</p>

	<p>just two locations: squares A and B. The vacuum agent perceives which square it is in and whether there is dirt in the square. It can choose to move left, move right, suck up the dirt, or do nothing. One very simple agent function is the following: if the current square is dirty, then suck; otherwise, move to the other square.</p> <p>Formulate the above problem.</p>
E	<p>Apply fuzzy reasoning with the help of generalized modus ponens to derive conclusion “customer is very satisfied” given</p> <p>U={ service-rating={a,b,c,d,e}</p> <p>V= satisfaction-grade={1,2,3,4,5}</p> <p>The sequences a,b,c,d,e and 1,2,3,4,5 are in descending and ascending order respectively. The fuzzy sets good service and satisfied are given below.</p> <p>good-service = 1.0    0.8    0.6    0.4    0.2                    ---- + ---- + ---- + ---- + ----                    a    b        c    d        e</p> <p>satisfied =    0.2    0.4    0.6    0.8    1.0                    ---- + ---- + ---- + ---- + ----                    1    2        3    4        5</p> <p>Very-good-service =    0.8    0.6    0.4    0.0    0.0                                    ---- + ---- + ---- + ---- + ----                                    1    2        3    4        5</p>
F	<p>A neuron with four inputs has the weight vector <math>W=[1 \ 2 \ 3 \ 4]</math>. The activation function is linear that is, the activation function is given by <math>f(\text{net})=2*\text{net}</math>. If the input vector is <math>X = [4 \ 5 \ 6 \ 7]</math> then, find the output of the neuron.</p>

<b>Q3.</b> <b>(20 Marks)</b>	<b>Solve any Four out of Six 5 marks each</b>																		
A	<p>Consider the search problem below with start state S and Goal state G. The transition cost are next to the edges and the heuristic values are as shown in the table. Calculate the final cost using A* search algorithm.</p> <table border="1"> <thead> <tr> <th>State</th> <th>S</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</th> </tr> </thead> <tbody> <tr> <td>h(n)</td> <td>6</td> <td>8</td> <td>6</td> <td>5</td> <td>4</td> <td>2</td> <td>1</td> <td>0</td> </tr> </tbody> </table> <p>Table :Heuristic Values – Straight line distance to G</p>	State	S	A	B	C	D	E	F	G	h(n)	6	8	6	5	4	2	1	0
State	S	A	B	C	D	E	F	G											
h(n)	6	8	6	5	4	2	1	0											
B	<p>Convert the following sentences into FOL</p> <ul style="list-style-type: none"> <li>Everyone likes McDonalds unless they are allergic to it</li> </ul>																		

	<ul style="list-style-type: none"> <li>▪ Sibling is “symmetric”</li> <li>▪ One’s mother is one’s female parent</li> <li>▪ A first cousin is a child of a parent’s sibling</li> <li>▪ “There is a person who loves everyone in the world”</li> </ul>
C	Explain single layer feed forward and multilayer feed forward networks.
D	<p>Fuzzy If then else rule R has the form If “x is A” Then “y is B” Else “Y is C”</p> <p>Consider R: If “distance is long” Then “speed is high” Else “speed is moderate”.</p> <p>The relevant sets (crisp and fuzzy) are distance = { 100,500,1000,5000} is the universe of the fuzzy set long distance, speed = { 30,50,70,90,120} is the universe of the fuzzy sets high speed as well as moderate speed, and</p> $\text{Long-distance} = \frac{0.1}{100} + \frac{0.3}{500} + \frac{0.7}{1000} + \frac{1.0}{5000}$ $\text{High-Speed} = \frac{0.1}{30} + \frac{0.3}{50} + \frac{0.5}{70} + \frac{0.7}{90} + \frac{0.9}{120}$ $\text{Moderate-Speed} = \frac{0.3}{30} + \frac{0.8}{50} + \frac{0.6}{70} + \frac{0.4}{90} + \frac{0.1}{120}$ <p>Find “R” by applying Fuzzy If Then Else rule</p>
E	List out the importance of an expert system and give various applications of expert systems in diverse domains.
F	Illustrate the need for soft computing and highlight the differences between soft computing and hard computing by listing few examples of both the computing techniques.