University of Mumbai
Examination June 2021
Examinations Commencing from 1st June 2021

Program: **Information Technology**
Curriculum Scheme: Rev 2019
Examination: BE Semester IV
Course Code: ITC404 and Course Name: AUTOMATA THEORY

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which symbol is used to represent a Transition Function of Finite Automata?
Option A:	β
Option B:	δ
Option C:	∑
Option D:	ε
2.	What is the language of Finite Automata?
Option A:	Recursive Language
Option B:	Context-Sensitive Language
Option C:	Regular Language
Option D:	Context-Free Language
3.	Number of states in NFA are
Option A:	Less than or equal to equivalent DFA
Option B:	Less than equivalent DFA
Option C:	Greater than equivalent DFA
Option D:	Greater than or equal to equivalent DFA
4.	What is the correct form of productions in Chomsky Normal Form?
Option A:	A -> aB
Option B:	A - > BC
Option C:	A -> B
Option D:	A -> Ba
5.	The language WW^R is accepted by-
Option A:	Deterministic Pushdown Automata
Option B:	Non-Deterministic Finite Automata
Option C:	Deterministic Finite Automata
Option D:	Non-Deterministic Pushdown Automata
6.	The transition δ (q1,a,a) = (q_f, ε) of PDA is -
Option A:	Performing delete and pop operation
Option B:	Performing delete operation only
Option C:	Performing pop operation only
Option D:	Performing push operation

7.	What is the language of the Turing machine?
Option A:	Regular language
Option B:	Context free language
Option C:	Recursive enumerable language
Option D:	Context sensitive language
8.	What is the limitation of regular grammar?
Option A:	Can generate simple strings
Option B:	Can only describe regular language
Option C:	Can’t generate long strings
Option D:	Too difficult to understand
9.	DFA designed to accept strings with no more than 2 a’s can accept:
Option A:	a b a b
Option B:	a b a a
Option C:	b a a a
Option D:	a b a b a b a b
10.	The length of Moore machine compared to Mealy machine is:
Option A:	Equal to Mealy machine for given input
Option B:	Smaller than Mealy machine for given input
Option C:	One smaller than Mealy machine for given input
Option D:	One longer than Mealy machine for given input
11.	Derivation process is one which-
Option A:	Parses given string
Option B:	Generates new string
Option C:	Convert string to right linear grammar
Option D:	Convert string to left linear grammar
12.	Language of PDA is:
Option A:	Recursively Enumerable language
Option B:	Regular Language
Option C:	Context sensitive language
Option D:	Context free language
13.	The tuple Σ in Turing machine represents-
Option A:	Tape symbol
Option B:	Output symbol
Option C:	Tape alphabet
Option D:	Input alphabet
14.	A Turing Machine can compute problems which are-
Option A:	Complex
Option B:	Simple
Option C:	Unsolvable
Option D:	Computable

15.	Which of the following languages are most suitable for implementing context free languages?
Option A:	C
Option B:	Perl
Option C:	Assembly Language
Option D:	Compiler language
16.	With reference to the process of conversion of a context free grammar to CNF, the number of variables to be introduced for the terminals are: S->AB0 A->001 B->A1
Option A:	3
Option B:	4
Option C:	2
Option D:	5
17.	Next move function δ of a Turing machine M = (Q, Σ , Γ, δ, q0, B, F) is a mapping
Option A:	δ : Q x Σ --> Q x Γ
Option B:	δ : Q x Γ ---> Q x Σ x {L, R}
Option C:	δ : Q x Σ ---> Q x Γ x {L, R}
Option D:	δ : Q x Γ ---> Q x Γ x {L, R}
18.	Which of the following grammars are in Chomsky Normal Form:
Option A:	S->AB|BC|CD, A->AB B->CD, C->2, D->3
Option B:	S->AB, S->BCA|0|1|2|3
Option C:	S->ABa, A->aab, B->Ac
Option D:	S->ABa, A->AAB, B->Ac
19.	The lexical analysis for a high level language needs the power of which one of the following machine models?
Option A:	Turing Machine
Option B:	Deterministic pushdown automata
Option C:	Finite state automata
Option D:	Non-Deterministic pushdown automata
20.	Which of the following relates to Chomsky hierarchy?
Option A:	Regular<CFL<CSL<Unrestricted
Option B:	CFL<CSL<Unrestricted<Regular
Option C:	CSL<Unrestricted<CF<Regular
Option D:	CSL<Unrestricted< Regular<CF

Q2.	**Solve any Four questions out of Six. 5 marks each**
A	Construct DFA to accept strings that ends with substring 110 for Σ={0,1}
B	Design a Moore machine which counts the occurrence of substring bab in an input string for Σ = {a, b}.
C	Give Regular Expressions for

	i) For all strings over a,b which contains exactly 3 occurrence of b over Σ={a,b} ii) For all strings over 0,1 that starts with 10 and ends with 01
D	Let G be the grammar having the following set of production. S → ABA, A→ aA | bA | ϵ B→ bbb Find LMD and RMD for string "ababbbba"
E	Write Short Note on Chomsky Hierarchy
F	Compare and Contrast between FA, PDA and TM

Q3.	**Solve any Two Questions out of Three** **10 marks each**
A	Convert the given grammar G to CNF. G: S -> a | aA | B |C , A -> aB | ε , B -> Aa, C -> aCD | a, D -> ddd.
B	Design a Turing Machine for 2's Complement of a binary number
C	Design PDA for odd length palindrome let Σ = {0, 1}, $L = \{WCW^R\}$ $where$ $W \epsilon \Sigma *$

Course Code: ITC404 and Course Name: AUTOMATA THEORY
Answer Key

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	C
Q3.	A
Q4	B
Q5	D
Q6	C
Q7	C
Q8.	B
Q9.	A
Q10.	D
Q11.	B
Q12.	D
Q13.	D
Q14.	D
Q15.	C
Q16.	B
Q17.	D
Q18.	A
Q19.	C
Q20.	A

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Information Technology**

Curriculum Scheme: Rev2019

Examination: BE Semester IV

Course Code: ITC402 and Course Name: Computer Network and Network Design

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	OSI stands for
Option A:	Open system interconnection
Option B:	Operating system interface
Option C:	Optical service implementation
Option D:	Open service internet
2.	Which topology is most fastest topology?
Option A:	Star
Option B:	Hybrid
Option C:	Mesh
Option D:	Bus
3.	Which medium has the highest transmission speed?
Option A:	Coaxial Cable
Option B:	Optical fiber cable
Option C:	Twisted pair cable
Option D:	Electrical cable
4.	A bit-stuffing based framing protocol uses an 8-bit delimiter pattern of 01111110. If the output bit-string after stuffing is 011111000100, then the input bit-string is
Option A:	Output = 01111100100
Option B:	Output = 011111100100
Option C:	Output = 011111001100
Option D:	Output = 0111111111
5.	In CSMA/CD, the frame transmission time (Tt) should be _____ the propogation time(Tp)
Option A:	Tt > Tp
Option B:	Tt>=2Tp
Option C:	Tt>2Tp
Option D:	Tt > 1/Tp
6.	What is the total vulnerable time value of pure Aloha?
Option A:	1/2 Tfr
Option B:	Tfr
Option C:	2*Tfr

Option D:	4*Tfr
7.	A subset of a network that includes all the routers but contains no loops is called _____
Option A:	spanning tree
Option B:	cost tree
Option C:	path tree
Option D:	special tree
8.	In IPv6, the _____ field in the base header restricts the lifetime of a datagram.
Option A:	version
Option B:	next-header
Option C:	hop limit
Option D:	neighbour-advertisement
9.	The term _____ means that IP provides no error checking or tracking. IP assumes the unreliability of the underlying layers and does its best to get a transmission through to its destination, but with no guarantees.
Option A:	Reliable delivery
Option B:	Connection oriented delivery
Option C:	Best effort delivery
Option D:	Worst delivery
10.	OSPF protocol uses which algorithm?
Option A:	Distance Vector
Option B:	Path Vector
Option C:	Link State Routing
Option D:	RIP
11.	Which of the following transport layer protocols is used to support electronic mail?
Option A:	SMTP
Option B:	IP
Option C:	TCP
Option D:	UDP
12.	In TCP, one end can stop sending data while still receiving data. This is called a _____ termination.
Option A:	half-close
Option B:	half-open
Option C:	full-close
Option D:	Full open
13.	Which of the following functionalities must be implemented by a transport protocol over and above the network protocol?
Option A:	Recovery from packet losses
Option B:	Detection of duplicate packets
Option C:	Packet delivery in the correct order

Option D:	End to end connectivity
14.	In TCP, if the ACK value is 200, then byte _____ has been received successfully.
Option A:	199
Option B:	200
Option C:	201
Option D:	202
15.	The second phase of JPEG compression process is _____.
Option A:	DCT transformation
Option B:	Quantization
Option C:	lossless compression encoding
Option D:	None of the choices are correct.
16.	During an FTP session the data connection may be opened _____.
Option A:	only once
Option B:	only two times
Option C:	Five times
Option D:	as many times as needed
17.	The protocol data unit (PDU) for the application layer in the Internet stack is ____.
Option A:	segment.
Option B:	datagram.
Option C:	message.
Option D:	frame.
18.	A table of a router normally contains addresses belonging to _____ protocol.
Option A:	a single
Option B:	Two
Option C:	Three
Option D:	multiple
19.	The first address assigned to an organization in classless addressing _____.
Option A:	must be a power of 2
Option B:	must be a power of 4
Option C:	must belong to one of the A, B, or C classes
Option D:	must be evenly divisible by the number of addresses
20.	An organization is granted a block of classless addresses with the starting address 199.34.32.0/27. How many addresses are granted?
Option A:	4
Option B:	8
Option C:	16
Option D:	32
Q2.	**Solve any Two out of Three** **10 marks each**
A	Explain the OSI Model in brief with suitable figure
B	What is a sliding window? Explain Go back N protocol in detail

C	What do you mean by switching? What are the types of switching techniques

Q3.	**Solve any Two out of Three** **10 marks each**
A	What is congestion and what are causes of congestion?
B	Compare TCP and UDP.
C	Consider five source symbols of a discrete memory less source. Their probabilities are given below. Find the Huffman code for eace symbol.

Symbol	M1	M2	M3	M4
probability	0.4	0.3	0.2	0.1

Course Code: ITC402 and Course Name: Computer Network and Network Design

Answer key

Question Number	**Correct Option (Enter either 'A' or 'B' or 'C' or 'D')**
Q1.	A
Q2.	C
Q3.	B
Q4	A
Q5	B
Q6	C
Q7	A
Q8.	C
Q9.	C
Q10.	C
Q11.	C
Q12.	A
Q13.	D
Q14.	A
Q15.	B
Q16.	D
Q17.	C
Q18.	A
Q19.	D
Q20.	D

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Information Technology**

Curriculum Scheme: Rev2019

Examination: BE Semester IV

Course Code:ITC405 and Course Name: Computer Organization & Architecture

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Memory mapped I/O means
Option A:	Using separate memory address space for I/O ports
Option B:	Assigning a part of the main memory address space to I/O ports
Option C:	Using separate input and output instructions
Option D:	Using combined input and output instructions
2.	Instruction AND is executed by
Option A:	Decoder unit
Option B:	ALU
Option C:	Memory unit
Option D:	Control unit
3.	In memory Hierarchy which is the fastest memory
Option A:	SRAM
Option B:	DRAM
Option C:	Register
Option D:	Cache
4.	Cache memory is also known as
Option A:	Content Addressable Memory
Option B:	Content Accessible Memory
Option C:	Computer Addressable Memory
Option D:	Computer Accessible Memory
5.	Micro program consisting of _____ is stored in control memory of control unit
Option A:	Instructions
Option B:	micro instructions
Option C:	micro program
Option D:	macro program
6.	Choose appropriate sequence of instruction cycle

Option A:	Instruction fetch, Instruction address calculation, Instruction decode, operand address calculation , fetch operand, data operation, operand address calculation, operand store
Option B:	Instruction address calculation , Instruction fetch, operand address calculation fetch operand, Instruction decode, data operation, operand address calculation and operand store
Option C:	Instruction address calculation , Instruction fetch, Instruction decode, operand address calculation , fetch operand, data operation , operand address calculation, operand store
Option D:	Instruction address calculation, Instruction fetch, Instruction decode, operand address calculation , fetch operand, operand address calculation , operand store, data operation
7.	In Instruction Pipelining Structural Hazard means
Option A:	any condition in which either the source or the destination operands of an instruction are not available at the time expected in the pipeline
Option B:	a delay in the availability of an instruction causes the pipeline to stall
Option C:	the situation when two instructions require the use of a given hardware resource at the same time.
Option D:	When a data gets overwritten by branching
8.	Convert number($41.62)_8$ into equivalent hexadecimal number
Option A:	$(20.D8)_{16}$
Option B:	$(21.C8)_{16}$
Option C:	$(21.D8)_{16}$
Option D:	$(20.C8)_{16}$
9.	The sign and magnitude representation for +7 is
Option A:	00001000
Option B:	10000101
Option C:	10000111
Option D:	00000111
10.	8086 has 20 bit address lines to access memory, hence it can access
Option A:	100 MB
Option B:	1 KB
Option C:	1 MB
Option D:	10 MB
11.	The advantage of DMA is
Option A:	Avoiding busy waiting by CPU
Option B:	High speed data transfer between memory and I/O
Option C:	Polling
Option D:	Accessing CPU
12.	Program Counter Holds
Option A:	The Instruction
Option B:	The Data

Option C:	Address of the Current Instruction which is executed
Option D:	Address of the Next Instruction to be executed
13.	Which of the following is not a key characteristics of memory devices or memory system
Option A:	Location
Option B:	Physical Characteristics
Option C:	Availability
Option D:	Access Method
14.	In restoring division method when subtraction is said to be unsuccessful
Option A:	if result is positive
Option B:	if result is negative
Option C:	if result is zero
Option D:	if result is infinite
15.	The disadvantage of an SRAM is
Option A:	Very high power consumption
Option B:	Very high access time
Option C:	These are volatile memories
Option D:	Very low price
16.	The main memory contains 8K blocks, each consisting of 128 words. How many bits are there in a main memory address?
Option A:	19 bits
Option B:	21 bits
Option C:	22 bits
Option D:	20 bits
17.	In Restoring division Algorithm if A<0 then which of the following is immediate step (Assume M as Dividend Q as Divisor And A as result)
Option A:	Q_0 =0
Option B:	A= A +M
Option C:	Q_0 =0 & A=A-M
Option D:	Q_0 =0 & A=A+M
18.	Third generation of computer is between
Option A:	1940 and 1956
Option B:	1964 and 1971
Option C:	1972 and 2010
Option D:	1910 and 1930
19.	Find the output of full adder with A=1, B=0, C=1
Option A:	S=0,C=0
Option B:	S=0,C=1
Option C:	S=1,C=0
Option D:	S=1,C=1

20.	A combinational logic circuit which sends data coming from a single source to two or more separate destinations is
Option A:	MUX
Option B:	ENCODER
Option C:	DECODER
Option D:	DEMUX

Q2 **(20 Marks)**	***Solve any Four out of Six 5 marks each***
A	Explain the working of 8:1 Multiplexer.
B	Minimize the following four variable logic function using K-map f(A,B,C,D)=∑m(0,1,3,4,7,9,11,13,15)
C	Describe Flynn's classification of parallel computing in detail
D	Differentiate between Hardwired control unit and Micro programmed control unit
E	Identify the addressing modes of the following instructions 1.MOV AX,1000 2.MOV AX,[1000] 3.MOV AX,BX 4.MOV [BX],AX 5.MOV AX,[SI+200]
F	Write short note on DMA

Q3. **(20 Marks)**	***Solve any Two Questions out of Three 10 marks each***
A	Draw the flow chart of Booths algorithm for signed multiplication and Perform 7 x -3 using booths algorithm
B	Explain in detail with suitable Architecture of 8086 microprocessor
C	List and explain in detail characteristics /parameters of memory

Course Code: ITC405 Course Name: Computer architecture and Organization

Answer Key

Question Number	Correct Option (Enter either 'A' or 'B' or 'C' or 'D')
Q1.	B
Q2.	B
Q3.	C
Q4	A
Q5	B
Q6	C
Q7	C
Q8.	B
Q9.	D
Q10.	C
Q11.	B
Q12.	D
Q13.	C
Q14.	A
Q15.	C
Q16.	D
Q17.	D
Q18.	B
Q19.	B
Q20.	D

University of Mumbai

Examination June 2021

Examinations Commencing from 1st June 2021

Program: **Information Technology**

Curriculum Scheme: Rev-2019 'C' Scheme

Examination: S.E. Semester IV

Course Code: ITC 401 Course Name: Engineering Mathematics IV

Time: 2 hour Max. Marks: 80

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<table>
<tr><td>Q1.</td><td>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</td></tr>
<tr><td></td><td></td></tr>
<tr><td>1.</td><td>The region of rejection of the null hypothesis H_0 is known as</td></tr>
<tr><td>Option A:</td><td>Critical region</td></tr>
<tr><td>Option B:</td><td>Favourable region</td></tr>
<tr><td>Option C:</td><td>Domain</td></tr>
<tr><td>Option D:</td><td>Confidence region</td></tr>
<tr><td></td><td></td></tr>
<tr><td>2.</td><td>Sample of two types of electric bulbs were tested for length of life and the following data were obtained
<table>
<tr><td></td><td>Size</td><td>Mean</td><td>SD</td></tr>
<tr><td>Sample 1</td><td>8</td><td>1234 h</td><td>36 h</td></tr>
<tr><td>Sample 2</td><td>7</td><td>1036 h</td><td>40 h</td></tr>
</table>
The absolute value of test statistic in testing the significance of difference between means is</td></tr>
<tr><td>Option A:</td><td>t=10.77</td></tr>
<tr><td>Option B:</td><td>t=9.39</td></tr>
<tr><td>Option C:</td><td>t=8.5</td></tr>
<tr><td>Option D:</td><td>t=6.95</td></tr>
<tr><td></td><td></td></tr>
<tr><td>3.</td><td>If X is a poisson variate such that $P(X=1)=P(X=2)$, then $P(X=3)$ is</td></tr>
<tr><td>Option A:</td><td>$\frac{4e^2}{3}$</td></tr>
<tr><td>Option B:</td><td>$4e^2$</td></tr>
<tr><td>Option C:</td><td>$\frac{4}{3e^2}$</td></tr>
<tr><td>Option D:</td><td>$\frac{4}{e^2}$</td></tr>
</table>

4.	If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$, Then following is not the eigenvalue ofadj A.
Option A:	6
Option B:	2
Option C:	4
Option D:	3
5.	For the matrix $\begin{bmatrix} 2 & -1 & 1 \\ 1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ the eigenvector corresponding to the distinct eigenvalue $\lambda = 2$ is
Option A:	$\begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$
Option B:	$\begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$
Option C:	$\begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$
Option D:	$\begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix}$
6.	The necessary and sufficient condition for a square matrix to be diagonalizable is that for each of it's eigenvalue
Option A:	algebraic multiplicity > geometric multiplicity
Option B:	algebraic multiplicity = geometric multiplicity
Option C:	algebraic multiplicity < geometric multiplicity
Option D:	algebraic multiplicity ≠ geometric multiplicity
7.	If the characteristic equation of a matrix A of order 3×3 is $\lambda^3 - 7\lambda^2 + 11\lambda - 5 = 0$, then by the Cayley-Hamilton theorem A^{-1} is equal to
Option A:	$\frac{1}{5}(A^3 - 7A^2 + 11\mathrm{A})$
Option B:	$\frac{1}{5}(A^2 + 7A + 11\mathrm{I})$
Option C:	$\frac{1}{5}(A^3 + 7A^2 + 11\mathrm{A})$
Option D:	$\frac{1}{5}(A^2 - 7A + 11\mathrm{I})$
8.	Value of an integral $\int_0^{1+i}(x^2 - iy)dz$ along the path $y = x^2$ is
Option A:	$\frac{5}{6} - \frac{i}{6}$
Option B:	$-\frac{5}{6} - \frac{i}{6}$
Option C:	$\frac{5}{6} + \frac{i}{6}$

Option D:	$\frac{-5}{6}+\frac{i}{6}$
9.	Integral $\int \frac{5z^2+7z+1}{z+1}\,dz$ along a circle $\lvert z\rvert=\frac{1}{2}$is equal to
Option A:	1
Option B:	-1
Option C:	3/2
Option D:	0
10.	Analytic function gets expanded as a Laurent series if the region of convergence is
Option A:	Rectangular
Option B:	Triangular
Option C:	Circular
Option D:	Annular
11.	Residue of $f(z)=\frac{z^2}{(z+1)^2(z-2)}$ at a pole $z=2$ is
Option A:	4/9
Option B:	2/9
Option C:	1/2
Option D:	0
12.	z-transform of an unit impulse function $\delta(k)=\begin{matrix}1\,, & at\ k=0\\ 0\,, & otherwise\end{matrix}$ is
Option A:	1
Option B:	0
Option C:	-1
Option D:	K
13.	$z\{\sin(3k+5)\},\ k\geq 0$ is
Option A:	$\frac{z^2\sin 2-z\sin 5}{z^2-2zcos\ 3+1}$
Option B:	$\frac{z^2\sin 5+z\sin 2}{z^2-2zcos\ 3+1}$
Option C:	$\frac{z^2\sin 5-z\sin 2}{z^2-2zcos\ 3+1}$
Option D:	$\frac{z^2\sin 2+z\sin 5}{z^2-2zcos\ 3+1}$
14.	The inverse z-transform of $f(z)=\frac{z}{(z-1)(z-2)}$, $\lvert z\rvert>2$ is
Option A:	2^k-2
Option B:	2^k-1
Option C:	2^k+1
Option D:	2^k+2
15.	If the basic solution of LPP is $x=1, y=0$ then the solution is

Option A:	Feasible and non-Degenerate
Option B:	Non-Feasible and Degenerate
Option C:	Feasible and Degenerate
Option D:	Non-Feasible and non-Degenerate
16.	If the primal LPP has an unbounded solution then the dual has
Option A:	Unbounded solution
Option B:	Bounded solution
Option C:	Feasible solution
Option D:	Infeasible solution
17.	Dual of the following LPP is Maximize $z = 2x_1 + 9x_2 + 11x_3$ $x_1 - x_2 + x_3 \geq 3$ Subject to $-3x_1 + 2x_3 \leq 1$ $2x_1 + x_2 - 5x_3 = 1$ $x_1, x_2, x_3 \geq 0$
Option A:	Minimize $w = -3y_1 + y_2 + y'$ $-y_1 - 3y_2 + 2y' \geq 2$ Subject to $y_1 + y' \geq 9$ $-y_1 + 2y_2 - 5y' \geq 11$ $y_1, y_2 \geq 0$, y' unrestricted
Option B:	Minimize $w = -3y_1 + y_2 + y_3$ $-y_1 - 3y_2 + 2y_3 \geq 2$ Subject to $y_1 + y_3 \geq 9$ $-y_1 + 2y_2 - 5y_3 \geq 11$ $y_1, y_2, y_3 \geq 0$
Option C:	Minimize $w = 2y_1 + 9y_2 + 11y'$ $-y_1 - 3y_2 + 2y' \geq 3$ Subject to $y_1 + y' \geq 1$ $-y_1 + 2y_2 - 5y' \geq 1$ $y_1, y_2 \geq 0$, y' unrestricted
Option D:	Minimize $w = 2y_1 + 9y_2 + 11y_3$ $-y_1 - 3y_2 + 2y_3 \geq 3$ Subject to $y_1 + y_3 \geq 1$ $-y_1 + 2y_2 - 5y_3 \geq 1$ $y_1, y_2 \geq 0$, y' unrestricted
18.	Consider the NLPP: Maximize $z = f(x_1, x_2)$, subject to the constraint $h = g(x_1, x_2) - b \leq 0$. Let $L = f - \lambda g$, then the Kuhn-Tucker conditions are
Option A:	$\frac{\partial L}{\partial x_1} \geq 0, \quad \frac{\partial L}{\partial x_2} \geq 0, \quad \lambda h \geq 0, \quad h \geq 0, \quad \lambda \geq 0$
Option B:	$\frac{\partial L}{\partial x_1} = 0, \quad \frac{\partial L}{\partial x_2} = 0, \quad \lambda h = 0, \quad h \leq 0, \quad \lambda \geq 0$
Option C:	$\frac{\partial L}{\partial x_1} = 0, \quad \frac{\partial L}{\partial x_2} = 0, \quad \lambda h \geq 0, \quad h \leq 0, \quad \lambda \leq 0$

Option D:	$\frac{\partial L}{\partial x_1} \geq 0, \quad \frac{\partial L}{\partial x_2} \geq 0, \quad \lambda h \geq 0, \quad h \geq 0, \quad \lambda = 0$
19.	In a non-linear programming problem,
Option A:	All the constraints should be linear
Option B:	All the constraints should be non-linear
Option C:	Either the objective function or atleast one of the constraints should be non-linear
Option D:	The objective function and all constraints should be linear.
20.	Pick the non-linear constraint
Option A:	$xy + y \geq 7$
Option B:	$2x - y \leq 5$
Option C:	$x + y \leq 6$
Option D:	$x + 2y = 9$

Subjective/descriptive questions

Q2 **(20 Marks)**	**Solve any Four out of Six5 marks each**
A	In an exam taken by 800 candidates, the average and standard deviation of marks obtained (normally distributed) are 40% and 10% respectively. What should be the minimum score if 350 candidates are to be declared as passed
B	If A= $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$, By using Cayley-Hamilton theorem find the matrix represented by $A^8 - 5A^7 + 7A^6 - 3A^5 + A^4 - 5A^3 + 8A^2 + 2A + I$
C	Evaluate the following integral using Cauchy-Residue theorem. $I = \int_C \frac{z^2+3z}{\left(z+\frac{1}{4}\right)^2 (z-2)} dz$ where c is the circle $\left\|z - \frac{1}{2}\right\| = 1$
D	Obtain inverse z-transform $\frac{z+2}{z^2-2z-3}$, $1 < \|z\| < 3$
E	Solve by the Simplex method Maximize $z = 10x_1 + x_2 + x_3$ Subject to $x_1 + x_2 - 3x_3 \leq 10$ $4x_1 + x_2 + x_3 \leq 20$ $x_1, x_2, x_3 \geq 0$
F	Using Lagrange's multipliers solve the following NLPP Optimise $z = 4x_1 + 8x_2 - x_1^2 - x_2^2$ Subject to $x_1 + x_2 = 2$ $x_1, x_2 \geq 0$

Q3 **(20 Marks)**	**Solve any Four out of Six5 marks each**
A	When the first proof of 392 pages of a book of 1200 pages were read, the distribution of printing mistakes were found to be as follows.

	<table><tr><td>No of mistakes in page (X)</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>No. of pages (f)</td><td>275</td><td>72</td><td>30</td><td>7</td><td>5</td></tr></table> Fit a poisson distribution to the above data and test the goodness of fit.
B	Show that the matrix $\begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{bmatrix}$ is not diagonalizable.
C	If $f(z) = \frac{z-1}{(z-3)(z+1)}$ obtain Taylor's and Laurent's series expansions of f(z) in the domain $\|z\| < 1 \& 1 < \|z\| < 3$ respectively.
D	If $f(k) = \frac{1}{2^k} * \frac{1}{3^k}$ find $z\{f(k)\},\ k \geq 0$
E	Solve using dual simplex method Minimize $z = 2x_1 + 2x_2 + 4x_3$ $2x_1 + 3x_2 + 5x_3 \geq 2$ Subject to $3x_1 + x_2 + 7x_3 \leq 3$ $x_1 + 4x_2 + 6x_3 \leq 5$ $x_1, x_2, x_3 \geq 0$
F	Solve following NLPP using Kuhn-Tucker method Maximize $z = 2x_1^2 - 7x_2^2 - 16x_1 + 2x_2 + 12x_1x_2 + 7$ Subject to $2x_1 + 5x_2 \leq 105$ $x_1, x_2 \geq 0$

Course Code: ITC 401 Course Name: Engineering Mathematics IV

Answer Key

Question Number	**Correct Option (Enter either 'A' or 'B' or 'C' or 'D')**
Q1.	A
Q2.	B
Q3.	C
Q4	C
Q5	A
Q6	B
Q7	D
Q8.	C
Q9.	D
Q10.	D
Q11.	A
Q12.	A
Q13.	C
Q14.	B
Q15.	C
Q16.	D
Q17.	A
Q18.	B
Q19.	C
Q20.	A

University of Mumbai
Examination June 2021
Examinations Commencing from 1st June 2021

Program: **Information Technology**
Curriculum Scheme: Rev 2019
Examination: BE Semester IV
Course Code: ITC 403 and Course Name: Operating System

Time: 2-hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is operating system?
Option A:	Collection of programs that manages hardware resources
Option B:	System service provider to the application programs
Option C:	Interface between user and hardware
Option D:	Collection of programs that manages Software resources
2.	Which of the following is not the Network Operating system ?
Option A:	Ubuntu
Option B:	Windows 7
Option C:	Unix
Option D:	Mach
3.	--- provides the interface to access the services of operating system.
Option A:	System calls
Option B:	API
Option C:	Library
Option D:	Command interpreter
4.	The process enters from ------- state to ------ when interrupt occurs.
Option A:	Ready, Running
Option B:	Running, Waiting
Option C:	Running, Ready
Option D:	Waiting, Running
5.	Which of the statement is correct from the following statements? I. The long-term scheduler selects the process form the job pool and loads into the main memory II. The short-term scheduler selects the process from waiting queue and allocates to the processor for execution III. The execution frequency of short-term scheduler is more than long term scheduler IV. The medium-term scheduler executes less frequently than long term scheduler
Option A:	I and II
Option B:	II and III
Option C:	III and IV

Option D:	I and III
6.	In RR scheduling algorithm if the time quantum is increased more, then it acts as a ----- algorithm
Option A:	FCFS
Option B:	SJF
Option C:	Multilevel Queue
Option D:	Priority
7.	In which of the load balancing the specific task find for imbalance on each processor, if found then moves processes form one overloaded processor to Idle one.
Option A:	Pull Migration
Option B:	Push Migration
Option C:	Mutually exclusive Pull and Push Migration
Option D:	Hyper threading Algorithm
8.	The productive operating system, checks for the deadlock --------
Option A:	Every time the process requests recourse
Option B:	After a specific time interval
Option C:	When a system is in unsafe state
Option D:	Every time a resource request is made at a fixed time interval
9.	In a certain application a value of counting semaphore is 17. The following operations were completed on the semaphores in the given order 2P, 20P, 5V, 10V, 10P, 2P. What would be the new value of counting semaphore?
Option A:	2
Option B:	10
Option C:	0
Option D:	3
10.	Which of the statements are true in case of recovery from Deadlock ? I Ignore the processes which are in deadlock state II Abort all resources which are in deadlock III Abort one process at a time until deadlock cycle is eliminated IV Abort the process which requests the deadlocked resources
Option A:	Only III
Option B:	Only IV
Option C:	II and III
Option D:	Only IV
11.	In dynamic storage allocation problem, the --- fit and --- fit are preferable than ---- fit.
Option A:	Worst, First, Best
Option B:	Best, First, Worst
Option C:	Worst, Best, First
Option D:	Worst, First, Best
12.	Which of the sentence is false?

	I Valid bit indicates that the page is in process's logical address space II Valid and Invalid bits provides protection. III Invalid bit indicates that the page is not in process's logical address space IV Shared pages do not have the Valid, Invalid bits
Option A:	IV
Option B:	III
Option C:	I and II
Option D:	I and III
13.	Generally, each process has an associated ------
Option A:	Segment Table
Option B:	Page Table
Option C:	Cache
Option D:	Virtual Memory
14.	Which of the following are the likely causes of thrashing? I. There are too many applications in the system II. The segment size was very small III. First in first out policy is followed IV. Least recently used policy for page replacement is used
Option A:	II and IV
Option B:	I and III
Option C:	II and III
Option D:	I and IV
15.	After an allocation of space using the worst-fit policy the number of holes in memory --- .
Option A:	Increases by one
Option B:	Decreases by one
Option C:	Remains same
Option D:	Memory Reduces by the process size
16.	If there are 32 segments, each of size 1KB ,then the logical address should have ----
Option A:	13 bit
Option B:	14 bit
Option C:	15 bit
Option D:	16 bit
17.	----- causes file system fragmentation.
Option A:	Unused space or single file are not contiguous
Option B:	Used space is not contiguous
Option C:	Used space is non-contiguous
Option D:	Multiple files are non-contiguous
18.	Which of the statement is true
Option A:	RAID level 0 supports byte stripping
Option B:	RAID level 1 allows bit stripping
Option C:	RAID level 0 supports no mirroring and RAID 1 supports mirroring with block striping

Option D:	RAID protects against data protection.
19.	The number of applications in any given task at a particular time in Android are ----
Option A:	One
Option B:	Many
Option C:	Few
Option D:	Zero
20.	Which of the following which is not the characteristics of embedded system
Option A:	Real time operation
Option B:	Reactive Operation
Option C:	Continuity
Option D:	I/O device flexibility

Q2	**Solve any Two Questions out of Three 10 marks each**
A	Consider following processes. Calculate the Waiting and Turnaround time for each process using SJF and RR algorithm. Time quantum is 3.

Process Id	Burst Time	Arrival Time
P1	8	0
P2	4	1
P3	9	2
P4	5	3

B	What is a thread? How multithreading is beneficial? Compare and contrast different multithreading models.
C	What is semaphore and its types? How the classic synchronization problem -Dining philosopher is solved using semaphores?

Q3	**Solve any Two Questions out of Three 10 marks each**
A	Consider the page reference string 1,2,3,5,2,4,5,6,2,1,2,3,7,6,3,2,1,2,3,6. Calculate the Page fault using 1. Optimal 2. LRU 3. FIFO algorithms for a memory with three frames.

<table>
<tr><td>B</td><td>Consider the snapshot of a system. Answer the following questions based on Bankers Algorithm

<table>
<tr><td></td><td>Allocation</td><td>Max</td><td>Available</td></tr>
<tr><td></td><td>ABCD</td><td>ABCD</td><td>ABCD</td></tr>
<tr><td>P0</td><td>0012</td><td>0012</td><td>1520</td></tr>
<tr><td>P1</td><td>1000</td><td>1750</td><td></td></tr>
<tr><td>P2</td><td>1354</td><td>2356</td><td></td></tr>
<tr><td>P3</td><td>0632</td><td>0652</td><td></td></tr>
<tr><td>P4</td><td>0014</td><td>0656</td><td></td></tr>
</table>
i. What is the content of Need Matrix?
ii. Is the system is safe state? What is the safe sequence?</td></tr>
<tr><td>C</td><td>What is open-source operating system? What are the design issues of Mobile operating system and Real time operating system?</td></tr>
</table>

Course Code: ITC 403 and Course Name: Operating System

Answer Key

Question Number	**Correct Option (Enter either 'A' or 'B' or 'C' or 'D')**
Q1.	C
Q2.	B
Q3.	A
Q4	C
Q5	D
Q6	A
Q7	B
Q8.	D
Q9.	A
Q10.	B
Q11.	B
Q12.	A
Q13.	B
Q14.	B
Q15.	B
Q16.	C
Q17.	A
Q18.	C
Q19.	B
Q20.	C