Siliguri Institute of Technology
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Criteria 1.1.2 - The institution adheres to the academic calendar including for the conduct of CIE List of sample documents

1. Institute Academic Calendar
2. Sample Course Description
3. Sample Notification of Internal Examination
4. Sample Moderated Question paper of Internal Examination
5. Sample Question paper of Internal Examination
6. Sample Assignment
7. Sample Quiz
8. Sample Rubrics used for Continuous Assessment
9. Sample Result Sheet

## SILIGURI INSTITUTE OF TECHNOLOGY <br> Academic/activity Calendar for the year 2021

## ODD SEMESTER 2021:





Director Siliguri Institute of Technology

## SILIGURI INSTITUTE OF TECHNOLOGY

## Revised Academic/activity Calendar for the year 2022

## EVEN SEMESTER 2022:



## Note :

- Regular Invited lectures/workshop will be conducted by the departments taking prior approval.
- Review Meeting by IQAC on last week of every month.




## PAPER NAME : INTERNET TECHNOLOGY PAPER CODE : PEC-IT701A

# Course Description 

## Course Title/Code: Internet Technology/PEC-IT701A

Stream: IT, Year:- $4^{\text {th }}$, Semester:- $1^{\text {st }}$
Name of the Faculty: Debaditya Kundu
E-mail: debaditya.kundu@gmail.com

## i) Course Objective:

Students will be able to demonstrate different concepts of computer network and solve various real life problems using web based programming languages.

## ii) Course Outcomes:

After completion of this course the students are expected to be able to demonstrate following Knowledge, skills and attitudes
a) Students will be able to:

| COs | Outcomes | Targets |
| :---: | :--- | :---: |
| PEC-IT701A.1 | Summarize concepts of computer network, with various protocols. <br> (B.T. Level 2) | $60 \%$ marks |
| PEC-IT701A.2 | Design simple web pages using different web tools. Like JavaScript, <br> HTML, XML, CGI script and PERL. (B.T. Level 6) | $60 \%$ marks |
| PEC-IT701A.3 | Study different aspect of legal, ethical, security and privacy issues <br> related to the use of Internet based computer systems. (B.T. Level 4) | $60 \%$ marks |
| PEC-IT701A.4 | Describe the importance of real time multimedia applications over IP <br> and the concept of SEO. (B.T. Level 2) | $60 \%$ marks |

b) Once the student has successfully complete this course, he/she must be able to answer the following questions or perform/demonstrate the following:

| Sl. | Question | BT Level |
| :--- | :--- | :---: |
| 1. | Explain Chomp ( ) function? | 2 |
| 2. | Implement program in java script to validate name, age, email and password <br> fields using regular expression. (BT - level 3) | 3 |
| 3. | Explain Applet life cycle with suitable diagram. (BT - level 2) | 2 |


| 4. | Describe why VoIP is better than traditional phone service? (BT - level 1) | 1 |
| :--- | :--- | :---: |
| 5. | Resolve the broadcast address of the network 172.130.144.160, where the <br> subnet mask is given as $255.255 .255 .224 ?$ (BT - level 4) | 4 |
| 6. | Given message is $\mathrm{M}(\mathrm{X})=\mathrm{x}^{5}+\mathrm{x}^{4}+\mathrm{x}+1$ and the generator is $\mathrm{G}(\mathrm{X})=\mathrm{x}^{4}+\mathrm{x}^{3}+1$. <br> $(\mathrm{BT}$ - level 6) | 6 |

## Internet Technology <br> PEC-IT701A

## Contracts: 3L

Credits- 3

## UNIT - 1 (6L)

Introduction (1L):
Overview, Network of Networks,
Intranet, Extranet and Internet.

## World Wide Web (1L):

Domain and Sub domain,
Address Resolution,
DNS, Telnet, FTP, HTTP.

## Review of TCP/IP (1L):

Features, Segment, Three-Way Handshaking, Flow Control, Error Control, Congestion control, IP Datagram, IPv4 and IPv6.

## IP Subnetting and addressing (1L):

Classful and Classless Addressing, Subnetting.
NAT, IP masquerading,
IP tables.

## Internet Routing Protocol (1L):

Routing -Intra and Inter Domain Routing,
Unicast and Multicast Routing, Broadcast.

## Electronic Mail (1L):

POP3, SMTP.

## UNIT - 2(9L):

HTML (3L):
Introduction, Editors, Elements, Attributes, Heading, Paragraph.
Formatting, Link, Head, Table, List, Block, Layout,
CSS. Form, Iframe, Colors, Colorname, Colorvalue.

## Image Maps (1L):

Map, area, attributes of image area.

## Extensible Markup Language (XML) (4L):

Introduction, Tree, Syntax, Elements, Attributes,
Validation, Viewing.
XHTML in brief.

## CGI Scripts (1L):

Introduction, Environment Variable, GET and POST Methods.

## UNIT - 3 (10L):

## PERL (3L):

Introduction, Variable, Condition, Loop,
Array, Implementing data structure, Hash, String,
Regular Expression, File handling, I/O handling.

## JavaScript (4L):

Basics, Statements, comments, variable, comparison, condition, switch, loop, break.
Object - string, array, Boolean,
reg-ex. Function, Errors, Validation.

## Cookies (1L):

Definition of cookies,
Create and Store a cookie with example.

## Java Applets (2L):

Container Class, Components,
Applet Life Cycle, Update method;
Parameter passing applet, Applications.

## UNIT - 4 (4L):

Client-Server programming In Java (1L):
Java Socket,
Java RMI.

## Threats (1L):

Malicious code-viruses,
Trojan horses, worms; eavesdropping, spoofing, modification, denial of service attacks.

## Network security techniques (1L):

Password and Authentication; VPN, IP Security, security in electronic transaction,
Secure Socket Layer (SSL),
Secure Shell (SSH).

## Firewall (1L):

Introduction,
Packet filtering, Stateful,
Application layer, Proxy.

## UNIT - 5(5L):

Internet Telephony (1L):
Introduction,
VoIP.

## Multimedia Applications (2L):

Multimedia over IP: RSVP, RTP, RTCP and RTSP.
Streaming media, Codec and Plugins,
IPTV.

## Search Engine and Web Crawler (2L):

Definition, Meta data, Web Crawler, Indexing, Page rank, overview of SEO.

## iii) Unit Layout:

| Unit | Lecture Hours |
| :---: | :---: |
| UNIT - 1 | 5 hrs |
| UNIT - 2 | 8 hrs |
| UNIT -3 | 8 hrs |
| UNIT -4 | 4 hrs |


| UNIT -5 | 5 hrs |
| :---: | :---: |
|  |  |
| Total | 30 hrs |

## iv) Text Book \& Reference Books:

1. Web Technology: A Developer's Perspective, N.P. Gopalan and J. Akilandeswari, PHI Learning, Delhi, 2013. (Chapters 1-5,7,8,9).
2. Internetworking Technologies, An Engineering Perspective, Rahul Banerjee, PHI Learning, Delhi, 2011. (Chapters $5,6,12$ )

## v) Evaluation Scheme:

| Evaluation Criteria | Marks |
| :--- | :---: |
| First \& Second Internal Exam* | 15 |
| Assignments | 10 |
| Attendance | 5 |
| University Exam | 70 |
| Total | 100 |

* Two internal examinations are conducted; based on those two tests, average of them are considered in a scale of 15 .


## University Grading System:

| Grade | Marks |
| :--- | :--- |
| 0 | $90 \%$ and above |
| E | $80-89.9 \%$ |
| A | $70-79.9 \%$ |
| B | $60-69.9 \%$ |
| C | $50-59.9 \%$ |
| D | $40-49.9 \%$ |
| F | Below $40 \%$ |

## NOTICE

## FIRST INTERNAL EXAMINATION

As per the given instruction by MAKAUT, all the current semester students of Computer Science $23 / 03 / 2022$ to $25 / 03 / 2022$ as per the given "Internal Examination - I" will be held from exam. It will be conducted through offline mode. Question Format: (30 Marks)

| GROUP | NUMBER OF QUETSIONS | MARKS | TOTAL |
| :---: | :---: | :---: | :---: |
| A | 5 | 1 | 5 |
| B | 2 | 5 | 10 |
| C | 1 | 15 | 15 |

Internal Examination - I (Schedule)


## Co-ordinator of Internal Examination Committee

(Department of Computer Science and Engineering)


# SILIGURI INSTITUTE OF TECHNOLOGY 

## Department of Electronic and Communication Engineering

$1^{\text {st }}$ Internal Exam - 2022 (Even Semester)
Semester: $4^{\text {th }}$
Subject : Design and Analysis of Algorithm Paper Code : ES CS 401
Requir wer GROUPA: MCQ $\quad \mathbf{1 \times 5}=\mathbf{5}$

1. a) $T(n)=C+T(n-1)$ if $n>1$. Time complexity of the relation is: $\quad$ (CO1)
i) $O\left(n^{2}\right)$ ii) $O\left(n^{3}\right)$ iii) $O\left(2^{n}\right)$ iv) None of these
b) The Asymptotic notation omega( $\Omega$ ) denoted as:
(CO1)
i) Tightly bound ii) Lower bound iii) Upper bound iv) None of these
c) $T(n)=2 T(n / 2)+5 n$ if $n>1$. Time complexity of the relation is:
(CO1)
i) $O\left(5 . n^{2}\right)$ ii) $O\left(5 . n^{0}\right.$ ) iii) $O(5 . \log n$ ) iv) $O(n . \log n)$
d)Time complexity of Binary search is: (CO2)
i) $O\left(n^{2}\right)$ ii) $O(n)$ iii) $O(\log n)$ iv) $O(n / 2)$
e) Time complexity of Brute-Force Approach of ' $n$ ' bit input length.
i) $O(n)$ ii) $O\left(n^{n}\right)$ iif) $O\left(2^{n}\right)$ iv) $O\left(n^{2}\right)$

GROUP B :
Answer Any Two Question
$2 \times 5=10$
2. Write an algorithm for matrix chain multiplication using Dynamic programming(CO3)
3.Write an algorithm for Merge sort using Divide and conquer Strategy.
4. Write an algorithm for Quick sort using Divide and conquer Strategy.
5. Find the Optimal solution using Dynamic programming having knapsack capacity 100 for the list of item and weight given bellow:

| Item | Value | Weight |
| :---: | :---: | :---: |
| 1 | 10 | 15 |
| 2 | 20 | 25 |
| 3 | 30 | 35 |
| 4 | 40 | 45 |
| 5 | 50 | 55 |

GROUP C :
Answer Any Two Question
$2 \times 7.5=15$
6. Analyse the average and Best case Time complexity of Quick sort. A machinesrequired 100 ms to sort 1000 record using merge sort. How much time required to sort $\mathbf{2 0 0 0}$ records.
(CO2)
7. Find the Optimal cost to multiply a list of matrix. The dimensions of the matrix given bellow :

$$
\mathrm{P}[3,2,1,4,2](\mathrm{CO})
$$

8. Find the minimum distance and path for Travelling and Salesman Problem using Dynamic Programming . In the following figure The Salesman start from city "a" (CO3)

9. Analyse the time complexity of merge sort.


## Siliguri Institute of Technology

## Department of Electronics and Communication Engineering $1^{\text {th }}$ Internal Exam-2022(Even Semester)

| Semester: $8^{\text {th }}$ | Group: A and B |
| :--- | :--- |
| Paper Code: OE-EC804C | Paper Name: Organizational Behavior |
| Full Marks: 30 | Time: 1hour |

## Group -A

## Multiple choice questions

(Aligned to CO 1)

1. The organizational behavior consists of
(a)organization theory
(b)organization development (c)personal resources (d)All of the above
2. The fundamental of organizational behavior is
(a )individual differences
(b)a whole person
(c )caused behaviour
(d )All of these
3. Which is the element of bureaucracy?
(a) Rules and regulations
(b )Hierarchy of authority
(c) Departmentation
(d )All of these
4. Components of organization theory are
(a )goals
(b) work
(c )adaptation
(d )All of these
5. Which of the following is not the modern theory of organization behavior?
(a) Fusion process theory
(b )Biological theory
(c) Behaviour approach theory
(d) Comparative theory

## Group-B

Attempt any two questions.
(Aligned to CO2)
6. What do you mean by perceptual selectivity?(5)
7. Analyse the relevance of Alderfers ERG theory of motivation.(5)
8.Group Decison Making has its own merits and demerits. Elucidate.(5)

## Group-C

## Attempt any one question

(Aligned to CO2)
( $15^{*} 1=15$ )
9. Suppose that you are a manager and find yourself with one group of subordinates who apparently seek higher order need satisfactions at work and another group seek lower order need satisfaction at work. What would you do to motivate them?(15)
10. You have been hired as a Senior HR manager in a leading MNC based in Bangalore. What types of applied motivational strategies would you adopt in order to engage and retain your employees ? Suggest a road map to your organization's Vice-President HR. (15)


## Siliguri Institute of Technology

Department of Electronics \& Communication Engineering
$1^{\text {st }}$ Internal Exam - 2022 (Even Semester)
March-2022

| Semester: 6 th | Group: B |
| :--- | :--- |
| Paper Code: EC 601 | Paper Name: Computer Network |
| Full Marks: $\mathbf{3 0}$ | Time: 1 hour $\mathbf{3 0}$ minutes |

## Answer all questions:

## Q1. (Aligned to CO1)

a. What is the number of layers in the OSI model?
i) 2 ii) 4 iii) $7 \mathrm{iv} / 9$
b. Identify the layer which provides service to the user
i) Session layer i)
ii) Application Layer
iii) Presentation Layer
iv) Physical Layer
c. What does a set of rules define?
i) SMTP ii) FTP
iii) IMAP iv) Protocol
d. Identify the protocol primarily used for browsing data
i) FTP
ii) $T C P$
iii) TFTP
iv) HTTP
e. Identify the incorrect network topology

## i) bus ii) star iii) p2p iv) mesh

Q2. (Aligned to CO1)
Compare mesh and star topology with neat diagram.
OR
What do you mean by line coding? For a signal represented by 01001110 draw patterns using the schemes Polar NRZ and Bipolar NRZ.

Q3. (Aligned to CO2)
A $(7,4)$ Hamming code 1000110 was received by a receiver. Detect and correct the error if possible.
OR
Given the data word 1010011010 and the divisor 10111. Show the generation of the code word at the sender side and checking of the same at the receiver side(assuming no error).

Q4.(Aligned to CO 2 )
Explain the Go-Back_N ARQ protocol with neat diagram.
OR
Explain slotted ALOHA protocol with neat diagram.

## SILIGURI INSTITUTE OF TECHNOLOGY BACHELOR IN TECHNOLOGY(ECE) CA4 INTERNAL EXAM $\longrightarrow 2$ nd BIOLOGY FOR ENGINEERS MAXIMUM MARKS: 25 MAXIMUM TIME: 60 MINS

## Group: A

1. Answer any five of the following: $\quad[5 \times 1=5]$ a) Amino acids are linked tegether by :(CO 2)
a) peptide bonds
b) hydrogen lonods
c) glyoosidic linkages
d) hydrophohic interactions
b) Which of the following amine acids has to be supplemented in the diet? ( CO 2 )
(a) phenylalanine
(b) cysteine
(c) glutamine
(d) asparagine
c) This is an example of derived lipids (CO2)
(a) Terpenes
(b) Steroids
(c) Carotenoids
(d) All of the above
d) This enzyme catalyzes the transfer of a phosphoryl group from ATP to glucose(CO3)
(a) Hexohinase
(b) Phosphoglucose isomerase
(c) Aldolase
(d) Phosphoglucose mutase
e)FAD is reduced in which of the reaction of the Kreb's cycle?(CO3)
(a) Isocitrate to oxaloacetate
(b) Succinyl CoA to Succinate
(c) Fumarate to malate
(d) Succinate to fumarate
f) Non-cyclic photophosphorylation results in the production of-(CO3)
a NADH
b NADPH
c ATP
d ATP and NADPH
g) $\mathrm{C}_{4}$ pathway takes place in(CO3)
(a) Xylem
(b) Bundle sheath cells
(c) Phloem
(d) Mesophyll cells

## Group B

## 2. Answer any four of the following: [ $5 \times 4=20$ ]

1) With a suitable diagram represent the TCA Cycle? (CO3)
2) Write about the difference between light reaction and dark reaction of photosynthesis? (CO3)
3) Write about the Classification system in Amino acids'(CO2)
4) Write a short note on ETC (Electron transport chain? (CO3)
5) With a suitable diagram represent the Glycosis cycle? (CO3)
6) Write a short note on structure of $1-R N A$ with suitable diagram(CO2)

## Siliguri Institute of Technology Department of Electronics \& Communication Engineering $2^{\text {nd }}$ Internal Exam - 2022(Even Semester) <br> March - 2022



## Group: B

| Semester: $\mathbf{6 t h}$ | Group: B |
| :--- | :--- |
| Paper Code: EC 602 | Paper Name: Computer Network |
| Full Marks: $\mathbf{2 5}$ | Time: 1hour |

Q1. Answer any five $(\mathrm{CO} 2, \mathrm{CO} 3) 5 \times 1=5 \rightarrow$ specéfy $C$ for individual questions a. Flow control is the responsibility of?
i) Physical layer ii) Data link layer iii) transport layer iv)application layer
b. Identify the layer which provides service to the user
i) Session layer ii) Application Layer iii) Presentation Layer iv) Physical Layer
c. In selective repeat sliding window protocol, the window size is
i) one ii) two iii) greater than oneiv) none of these
d. Identify the protocol primarily used for browsing data
i) FTP ii) TCP iii) TFTP iv) HTTP
c. Hamming code is used for
i) error detection ii) error correction iii) error encapsulation iv) both (i) and (ii)
f. port addressing is the function of
i) Physicallayer ii) Network layer iii) Data link Layer iv) transport layer
g. Which of the following is a valid host for network 192.168.10.32/28
i) 192.168 .10 .39 ii) 192.168 .10 .47 iii) 192.168 .10 .14 iv) 192.168 .10 .54

## Answer any 4

(4X5=20)
Q2. Explain the CSMA/CA protocol with flowchart (CO2)
Q3. Explain the operation of CDMA technology (CO2)
(34. Explain link state routing.(CO3)

Q5. State the difference between bit rate and baud rate. State Nyquist theorem. (COI)
Q6. Draw the IPV4 datagram header format and explain each field. (CO3)


## Siliguri Institute of Technology

 Department of Electronics and Communication EngineeringB. Tech. $3^{\text {rd }}$ Year $1^{\text {st }}$ Semester ${ }^{1}{ }^{\text {st }}$ Internal Examination, 2022

Paper Name: Control \& Instrumentation
Full Marks: 30

Paper Code: EC601
Times: 1h 00m

## $5 \times 1=5$

ANSWER ANY 5 QUESTIONS
a. The inverse Laplace Transform of $1 /(s+3)$ is
a. $e^{-3 t}$
b. $3 e^{-3 t}$
c. $-3 e^{-3 t}$
d. $e^{3 t}$
ii. In an open loop system the control action is depends on ....a. input signal b. system variables c. Size of the system d. none of above.
iii. The system response can be tested better with... a. sinusoidal input signal b. unit impulse input signal c. ramp input signal d. exponentially decaying signal.
iv. The position and velocity errors of a type-2 system are
a. constant, infinity, b. infinity, constant c. zero, zero, d. zero, constant
v. Mass, in force voltage analogy, is analogous to
a. Inductance b. capacitance c. resistance d. none of the above
vi. The characteristic equation of a system is $S^{2}+3 S+2=0$

The system is. ...a. critically damped, b. under damped , constant c. zero, zero, d. zero, constant

## Question 2. (EC601.1)

1. Calculate Transfer function, characteristic equation, poles and zeros from the given differential equation $\frac{d^{2} y(t)}{{d t^{2}}^{2}}+\frac{d y(t)}{d t}+100 y(t)=\frac{d x(t)}{d t}+15 x(t)$
2. Calculate the overall transfer function using Block Diagram Reduction Technique or Signal flow graph method from the given figure

3. Determine the transfer function of the network shown in the figure.

4. Draw the analogous electrical network of the given system use $\mathrm{F}-\mathrm{V}$ analogy.


## Question 3. Answer any one question

(15x1=15)

1. The open loop transfer function of a unity negative feedback system is given by $G(s)=\frac{4}{s(s+5)}$ (a) Calculate transient response of a unit step input. (b) Rise time \& Peak time. (EC601.1)
2. Calculate Static, velocity and acceleration Error coefficient and steady state error from given transfer function $\mathrm{G}(\mathrm{s})=\frac{(\mathrm{s}+1)}{\mathrm{s}(\mathrm{s}+2)} \mathrm{H}(\mathrm{s})=1$. (EC601.1)
3. Construct Routh array table and determine the stability of the system represented by the characteristics equation $S^{5}+S^{4}+2 S^{3}+2 S^{2}+3 S+5=0$. Comment on the location of the roots of characteristic equation. (EC601.2)

# Siliguri Institute of Technology <br> Department of Electronics and Communication Engineering 

$2^{\text {nd }}$ Internal Exam - 2022(Even Semester)
May - 2022

| Semester: $\mathbf{4}^{\text {th }}$ | Group: A and B |
| :--- | :--- |
| Paper Code: EC 401 | Paper Name: Analog Communication |
| Full Marks: $\mathbf{2 5}$ | Time: 1 hour |

## Q1. Answer any five questions

$1 * 5=5$
i. Which of the following analog modulation scheme requires the minimum transmitted power and minimum channel bandwidth
[CO2]
a) VSB
b) DSB-SC
c) SSB
d) AM
ii. In a super heterodyne receiver, the IF is 455 kHz . If it is tuned to 1200 kHz , the image frequency will be
[CO4]
a) 1655 kHz
b) 2110 kHz
c) 745 kHz
d) 910 kHz
iii. The selectivity of most receivers is determined largely by
[CO4]
a)Sensitivity
b) characteristics of IF section
c) antenna direction
d) all of the above
iv. FM signal is better than AM signal because
[CO3]
a)Less immune to noise
b) Less adjacent channel interference
c) Amplitude limiters are used to avoid amplitude variations
d) All of the above
v. A 100 MHz carrier is frequency modulated by 10 KHz wave. For a frequency deviation of 50

KHz , calculate the modulation index of the FM signal.
[CO3]
a) 100
b) 50
c) 70
d) 90
vi. What is the maximum modulating frequency allowed in commercial FM broadcastings? [CO3]
a) 40 KHz
b) 75 KHz
c) 15 KHz
d) 120 KHz
vii. What is the maximum frequency deviation allowed in commercial FM broadcasting? [CO3]
a) 100 KHz
b) 75 KHz
c) 15 KHz
d) 120 KHz

## Q2. Answer any four of the following

i. What is Super Heterodyne receiver? What is IF and what is the IF value used for AM receive? What do you mean by image frequency?
[CO4]
ii. With proper justification discuss the conversion of FM from PM.
iii. Derive the expression for single tone FM and identify the parameters of FM (modulation index, frequency deviation).
[CO3]
iv. Write down Carson's rule. An angle modulated signal with carrier frequency $\omega_{c}=2 \pi \times$ $10^{5}$ is described by the following equation
[CO3]

$$
\varphi_{F M}(t)=10 \operatorname{Cos}\left(\omega_{c} t+5 \operatorname{Sin} 3000 t+10 \operatorname{Sin} 2000 \pi t\right)
$$

Find out: a) power of the modulated signal b) frequency deviation c) Deviation ratio $\beta$ d) bandwidth of the modulated signal.
v. The maximum deviation allowed in an FM broadcast system is 75 KHz . If the modulating signal is a single tone sinusoid of 10 KHz . Find the BW of the FM signal. What will be the change in BW , if the modulating frequency is doubled? [CO3]
vi. Explain FM generation using Armstrong method.

# SILIGURI INSTITUTE OF TECHNOLOGY 

 DEPARTMENT OF ECE$2^{\text {nd }}$ Internal Examination (CA4) - May 2022
PAPER NAME: CMOS VLSI DESIGN
FULL MARKS: 25
PAPER CODE: PE-EC603C
TIME: 1Hour

## Gr. A: ANSWER ANY FIVE MCQ TYPE QUESTIONS

(1) The ON resistance of a MOSFET
i) Linearly increases with Vgs
ii) Linearly decreases with Vgs
iii) Exponentially increases with Vgs
iv) Non-linearly decreases with Vgs
(2) The body effect occur due to potential difference between
[CO3]
i) Source and Body
ii) Body and drain
iii) Gate and Body
iv) None
(3) Minimum number of transistors required to design an X-OR gate is
i) $\operatorname{Six}$
ii) Eight
iii) Twelve
iv) Ten
(4) Which one effect does not cause any deviation of a current mirror circuit from the ideal situation?
[CO4]
i) Channel Length Modulation
ii) Threshold offset between two transistors
iii) Imperfect geometry matching
iv) DIBL effect
(5) A MOS device can be used as a Resistor in
i) Linear region
ii) Saturation region
iii) Sub-threshold condition
iv) None
(6) In VHDL, which architectural style represents the lowest level of abstraction?
i) Behavioural Modelling
ii) Structural Modelling
iii) Dataflow Modelling
iv) Mixed Modelling.
(7) In VHDL sequential statements are defined in
ii) Process
i) Architecture
iv) None

## Group B: ANSWER ANY FOUR

Q1. Realize a 2:1 Mux using CMOS Transmission Gate.
Q2. Explain the operation of CMOS Inverter with the help of VTC curve.
Q3. Explain the operation of a Current Mirror and highlight the causes of deviation from Ideal situation.

## ECE-5th Sem 2nd Internal Exam for CA4 <br> (2021) <br> Duration 1 hour

*Required

1. Email *
2. Name *
3. Roll No. *
$\qquad$

Questions
4. In a multiphase chopper, the different choppers operate in [CO2] *

Mark only one oval.series and all simultaneouslyparallel and one at a timeparallel and simultaneouslyeither (b) or (c)
5. Transformer utilization factor is a measure of the merit of a rectifier circuit. It is the ratio of [CO2] *

Mark only one oval.$A C$ input power to the transformer volt - amp rating required by secondaryAC input power to the transformer volt - amp rating required by primaryDC output power to the transformer volt - amp rating required by secondaryDC output power to the transformer volt - amp rating required by primary
6. UJT has negative resistance region [CO1] *

Mark only one oval.a)between peak and valley pointsb)before the peak pointc) after the valley pointd) both a) and b)
7. The typical dv/dt rating of thyristor is [CO1] *

Mark only one oval.0.1 microamp. to 1 microamp.0.5 microamp. to 5 microamp.20 microamp. to 500 microamp.1000 microamp.
8. Snubber circuit is used for $\qquad$ protection of thyristor [CO1] *

Mark only one oval.di/dt$d v / d t$over currentgate
9. The MOSFET combines the areas of $\qquad$ \& $\qquad$ [CO1] *

Mark only one oval.semiconductor \& TTLmos technology \& CMOS technologyfield effect \& MOS technologynone of the mentioned
10. When latch-up occurs in an IGBT [CO1] *

Mark only one oval.Ig is no longer controllableIc is no longer controllablethe device turns offIc increases to a very high value
11. In discontinuous conduction of single phase semiconverter and extinction angle $\beta<\pi$, each thyristor conducts for [CO2] *

Mark only one oval.$\beta$$\beta-\pi$a$a+\pi$
12. In a single phase semiconverter, if output voltage has peak and average values of 325 V and 133 V respectively, then the firing angle is [CO2] *

Mark only one oval.40 degree140 degree50 degree130 degree
13. In the below shown semi-converter circuit T1 \& T2 are fired at an angle a, 2 points the output voltage is zero when [CO2] *


Mark only one oval.$\pi<\omega t<a$$0<\omega t<a+\pi$$\pi<\omega t<\pi+a$$\pi<\omega t<2 \pi$
14. A semi-converter circuit gives the following voltage waveform on R load. Find the expression for the average output current with Vs = Vm sinct and firing angle a [CO2] *


Mark only one oval.(Vm/R $\pi$ ) cosa(Vm/R $\pi$ ) ( $1+\mathrm{cos} a$ )( $2 \mathrm{Vm} / \mathrm{R} \pi$ ) $\cos \mathrm{a}$(2Vm/R $\pi$ ) ( $1+\cos a$ )
15. SMPS stands for [CO4] *

Mark only one oval.Single Mode Power SupplyStore Mode Power SupplyStart Mode Power SupplySwitched Mode Power Supply
16. SMPS is used for [CO4] *

Mark only one oval.obtaining controlled ac power supplyobtaining controlled dc power supplystorage of dc powerswitch from one source to another
17. SMPS are based on the $\qquad$ principle. [CO4] *

Mark only one oval.Phase controlIntegral controlChopperMOSFET
18. Choose the incorrect statement. [CO4] *

Mark only one oval.SMPS is less sensitive to input voltage variationsSMPS is smaller as compared to rectifiersSMPS has low input rippleSMPS is a source of radio interference
19. A thyristor can be bought from the forward conduction mode to forward blocking mode by [CO1] *

Mark only one oval.the dv/dt triggering methodapplying a negative gate signalapplying a positive gate signalapplying a reverse voltage across anode-cathode terminals
20. The value of anode current required to maintain the conduction of an SCR even though the gate signal is removed is called as the [CO1] *

Mark only one oval.holding currentLatching Currentswitching currentpeak anode current
21. From the two transistor (T1 \& T2) analogy of SCR, the total anode current of SCR is $\qquad$ in the equivalent circuit. [CO1] *

Mark only one oval.the sum of both the base currentsthe sum of both the collector currentthe sum of base current of T1 \& collector current of T2the sum of base current of $\mathrm{T} 2 \&$ collector current of T 1
22. In VSI (voltage source inverters) [CO2] *

Mark only one oval.both voltage and current depend on the load impedanceonly voltage depends on the load impedanceonly current depends on the load impedancenone of the mentioned
23. The harmonic factor of nth harmonic is given by [CO2] *

Mark only one oval.
$\qquad$ VnV1/VnVn/V1none of the mentioned
24. Which of the following mentioned control strategy/strategies would require a feedback loop? [CO2] *

Mark only one oval.
$\qquad$ pwmconstant frequency systemcurrent limit control
$\qquad$ none of the mentioned
25. In case of a constant frequency system, Ton =(1/4)T. If the chopping frequency 2 kHz , find the value of Toff.[CO2] *

Mark only one oval.(1/8) ms$(3 / 8) \mathrm{ms}$$(1 / 8) \mu \mathrm{s}$(3/8) $\mu \mathrm{s}$

## Google Forms

# Siliguri Institute of Technology 

Department of Electronics \& Communication Engineering
1st Internal Exam - 2021 (Odd Sem)

Paper Code: EC-704B
Full Marks: 30

Paper Name: Embedded Systems
Time: 1hour

## GROUP-A (Covered CO1)

(Multiple Choice Type Questions - answer any 5 questions) $5 \times 1=5$

1. Choose the correct alternatives of the following questions -
I. A Microcontroller normally has which of the following devices on-chip?
a) RAM
b) ROM
c) I/O Ports
d) all of the above.
II. If Manchester Coding is used in serial communication then bit rate is
a) Half BAUD rate
b) Twice BAUD rate
c) Thrice Baud rate
d) None of these
III. The RISC Processors normally have a $\qquad$ number of general purpose registers.
a) Undefined
b) small
c) Large
d) none of these
IV. A CAN device using CAN controller receives or sends a bit at any instance by operating at the maximum rate of $\qquad$ -
a) 256 Kbps
b) 2.4 Mbps
c) 1 Mbps
d) none of the above
V. Data Transfer using Serial Peripheral Interface (SPI) is a $\qquad$ wire operation.
a) 1
b) 2
c) 3
d) None of these
VI. Data Transfer using $I^{2} \mathbf{C}$ bus is a $\qquad$ wire operation.
a) 1
b) 2
c) 3
d) None of these

GROUP-B (Covered CO1)

## (Short Answer type Questions)

2. (a) What is the difference between an Embedded System \& General purpose computing system.
(b) Briefly describe the hardware architecture of a generalised 'Embedded System'.

GROUP-C (Covered CO2)
(Long Answer type Question)
$1 \times 15=15$
3. Write short note on:
a) Serial Peripheral Interface (SPI) Port
b) Asynchronous Serial UART
c) Synchronous Serial Output

Describe the operation of an alphanumeric LCD interfacing using parallel port communication.

# Siliguri Institute of Technology <br> Department of <br> $\qquad$ ECE <br> $1^{\text {st }}$ Internal Exam-2021 (Odd Semester) <br> February- 2021 

| Semester: 5 |  |
| :--- | :--- |
| th | Group: A \& B |
| Paper Code: EC 501 | Paper Name: Electromagnetic Waves |
| Full Marks: 30 | Time: 1hour |

Answer all questions:

## Q1.(Aligned to CO1)

i) $\vec{\nabla} \times \vec{E}=0$ means the electric field $\mathbf{E}$ is produced by the
a) Static Charge
b) Moving Charge
C) E.M induction
d) Varying magnetic field
ii) For Conservative field which of the following equations holds good?
a) $\oint \vec{B} \cdot d s=0$
b) $\left\lceil\int \vec{E} \cdot d l=0\right.$
c) $\int \vec{H} \cdot d l=0$
d) $\int \vec{D} \cdot d s=0$
iii) Point Charges $\mathrm{Q}_{1}=1 \mathrm{nC}$ and $\mathrm{Q}_{2}=2 \mathrm{nC}$ are at a distance apart. Which of the following statements are incorrect
a) The force on $Q_{1}$ is repulsive
b) The force on $\mathrm{Q}_{2}$ is the same in magnitude as that on $\mathrm{Q}_{1}$
c) As the distance between them decreases, the force on $\mathrm{Q}_{1}$ increases linearly
d) The force on $\mathrm{Q}_{2}$ is along the line joining them
iv) Displacement current can flow through
a) Capacitor
b) Inductor
C) resistor
d) None of these
v) Divergence of which quantity will be zero
a) $\mathbf{E}$
b) $\mathbf{D}$
c) $\mathbf{H}$
d) $\mathbf{B}$

## Q2.(Aligned to CO2)

i) What is loss tangent? Derive the expression for intrinsic impedance when the wave is propagating through lossy dielectric.

## OR

ii) Prove that the electromagnetic power passing through free space is given by the expression $E \times H W / m^{2}$

Q3. (Aligned to CO3)
i) Derive the expression for: a) input impedance of a lossless transmission line. b) input impedance of a $\frac{\lambda}{4}$ transmission line.

OR
ii) a) Derive the voltage and current equation of two wire transmission line. obtain the expression for $Z_{0}, \alpha$ and $\beta$ of a distortion less transmission line.

# Siliguri Institute of Technology 

Department of Electronics \& Communication Engineering
1 ${ }^{\text {st }}$ INTERNAL EXAMINATION, ODD SEM 2021
SUBJECT: Mathematics IIIB (BS-M301)
SEMESTER: $3^{\text {rd }}$
MARKS: 30
TIME: 1hr.

1. Choose the correct alternatives of the following:
i. A single letter is selected at random from the word 'STATISTICS'. The probability that it will be a vowel is
[BSM 301 CO1]
a. $\frac{1}{2}$
b. $\frac{7}{10}$
c. $\frac{3}{10}$
d. $\frac{2}{5}$
ii. If $P(A)=\frac{1}{3}, P(B)=\frac{1}{4}, P(A \cup B)=\frac{1}{2}$, then $P(B / A)$ is
[BSM 301 CO1]
a. $3 / 4$
b. $4 / 3$
c. $1 / 4$
d. $1 / 3$
iii. The probability $P(a<X \leq b)$, where $F(x)$ is the distribution function, is defined as [BSM 301 CO2]
a. $\quad F(b)-F(a)$
b. $F(b)+F(a)$
c. $F(a)-F(b)$
d. $F(a) F(b)$
iv. If $X$ and $Y$ are independent random variables, then
[BSM 301 CO 2$]$
a. $\quad E(X Y)=E(X)+E(Y)$
b. $E(X Y)=E(X)-E(Y)$
c. $\quad E(X Y)=E(X) E(Y)$
d. $E(X Y)=E(X) / E(Y)$
v. The arithmetic mean of $2,4,6, \ldots, 2 n$ is
[BSM 301 CO3]
a. $n+1$
b. $n(n+1)$
c. $(n+1) / 2$
d. $n(n+1) / 2$
2. Answer any two of the following:
i. Three machines $X, Y, Z$ produce respectively $60 \%, 30 \%$ and $10 \%$ of the total number of items of a factory. Of this output $2 \%, 3 \%$ and $4 \%$ are defective. An item is selected at random and is found defective. Find the probability that the item was produced by machine $Z$.
[BSM 301 CO1]
ii. In a town it has been known from census report that $40 \%$ of the total population is matriculate. 8 persons are selected at random. Find the probability that (i) exactly two of them are matriculate, (ii) at least two of them are matriculate.
[BSM 301 CO2]
iii. A random variable $X$ has a density function $f(x)$ given by

$$
\begin{aligned}
f(x) & =e^{-x}, \quad x \geq 0 \\
& =0, \text { elsewhere }
\end{aligned}
$$

Show that Tchebycheff's inequality gives $P(|X-1| \geq 2) \leq \frac{1}{4}$ and show that actual probability is $e^{-3}$.
[BSM 301 CO2]
3. Answer any one of the following:
$15 \times 1=15(8+7)$
i. (a) Out of two regression lines given by $x+2 y=5$ and $2 x+3 y=8$ which one is the regression line of $x$ on $y$ ? Find also the values of mean of $x$ and $y$, correlation coefficient and $\sigma_{y}$ given $\sigma_{x}=12$.
[BSM 301 C03]
(b) By least square method fit a second degree parabola $y=a+b x+c x^{2}$ to the following bivariate data [BSM 301 CO3]

| x | -1 | 0 | 1 | 2 | 3 | 4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| y | 4 | 2 | 6 | 16 | 32 | 54 |

ii. (a) The weight of a student in a college is normally distributed with $\mu=$ 40 kg and $\sigma=5 \mathrm{~kg}$. Find the percentage of the students that have weight i) greater than 40 kg ii) greater than 50 kg iii) between 38 kg and 52 kg . Given that $\Phi(2)=0.9772, \Phi(0.4)=0.6554, \Phi(2.4)=0.9918$ where $\Phi(x)=$ $P(Z \leq x)$.
[BSM 301 CO2]
(b) Show that

$$
\begin{aligned}
f(x) & =x, \quad 0 \leq x<1 \\
& =k-x, \quad 1 \leq x \leq 2 \\
& =0, \quad \text { elsewhere. }
\end{aligned}
$$

is a pdf of a random variable $X$ for a suitable value of $k$ which you have to determine. Then find the distribution function of the random variable $X$. Calculate the probability that the random variable lie between $1 / 2$ and $3 / 2$. [BSM 301 CO2]

Department: ECE
Paper Code: BSM 301
Question vs. CO mapping:

| Course Outcome | Question Number | Marks allotted |
| :---: | :--- | :--- |
| CO 1 | Q. 1. (i), (ii) | 1,1 |
|  | Q.2 (i) | 5 |
| CO 2 | Q.1. (ii), (iv) | 1,1 |
|  | Q.2. (ii), (iii) | 5,5 |
|  | Q.3. (ii) | 15 |
| CO 3 | Q.1. (v) | 1 |
|  | Q.3. (i) | 15 |

## CA 4_Assignment Questions

## All questions are mandatory

IMPORTANT: All must write the assignment in A4 size paper in their own handwriting and also mention your name and roll number. Scan the answer sheets and then upload in Google classroom within $\mathbf{1 7 . 0 2}$.2022, Thursday.

## MB101

1. (a) What is 'Market failure'? State the major causes of Market Failure.
(b) Write short note on Returns to Scale \& Relationship between AC and MC in short run.
2. Demand curve of a monopolist is $p=20-q$ and the cost function is

$$
\mathrm{C}=\mathrm{q}^{2}+8 \mathrm{q}+2
$$

Determine the equilibrium price and quantity.
3. (a) Consider the production function of a firm is $\mathrm{Q}=\mathrm{LK}$ and per unit costs of labour and capital are Rs 30 \& Rs 10 respectively. If the firm wants to produce 300 units of output, what should be the minimum cost?
(b) Consider the following total cost function of a firm

$$
\mathrm{TC}=200+25 \mathrm{Q}-2.8 \mathrm{Q}^{2}+0.12 \mathrm{Q}^{3}
$$

Determine the AC, AFC and MC functions. Find the value of $Q$ at which $M C=A V C$

## MB102

1. Differentiate between type A \& B personality.
2. What are the stages of group development?
3. What are the Characteristics of ideal org. structure?

## MB103

1. Discuss the importance of Business Communication in Management studies Or

Discuss the meaning of Business Communication and its nature and scope
2. Discuss the role of Meta communication in professional life Or

Discuss the role of KINESICS in professional life
3. XYZ corporate, Prafulla Chandra Sarkar Street, Kolkata 700001 is interested to recruit candidates in the post of Business executives who have qualified MBA with finance /HR / Marketing with effective communication skills, leadership skills ,sound computer knowledge and acquainted with the knowledge of multimedia apply with their resume and cover letter to "The HR.XYZ corporate ,Prafulla Chandra Sarkar Street ,Kolkata 700001.

## MB104

1. What are the essentials for trade mark under the Trade Marks act 1999 ?
2. Explain the contents of Memorandum of association and article of association.
3. What is the difference between Memorandum of association and Article of association?

## MB105

1. What is Business Ethics? What role does it play in organizational effectiveness? Give examples.
2. Explain how has Indian society changed with industrialization? Discuss is pros and cons
3. Define Ethics and Values. State the role of ethics in achieving Corporate Excellence.

## MB 106

1. Find the Optimal Assignment schedule of following machine \& job allocation problem

|  | J1 | J2 | J3 | J4 | J5 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| M1 | 9 | 11 | 15 | 10 | 11 |
| M2 | 12 | 9 | 10 | 10 | 9 |
| M3 | 11 | 11 | 14 | 11 | 7 |
| M4 | 14 | 8 | 12 | 7 | 8 |

2. Find the Dual of the following LPP:

Maximize $\mathrm{Z}=4 \mathrm{x}_{1}+\mathrm{x}_{2}+7 \mathrm{x}_{3}$
Subject to Constraints: $x_{1}+7 x_{2}-3 x_{3} \leq 4$;

$$
\begin{aligned}
5 x_{1}-x_{2}+x_{3} & \geq 12 \\
x_{1}+x_{2}+x_{3} & =10
\end{aligned}
$$

Where all the $\mathrm{x}_{1}, \mathrm{x}_{2}, \mathrm{x}_{3} \geq 0$
3. Apply the Principal of Dominance to solve the following game whose pay-offs are given below:-

$$
\left(\begin{array}{ccc}
4 & 7 & 1 \\
3 & 6 & -4 \\
-2 & -1 & 2
\end{array}\right)
$$

4. Find the Initial Basic Feasible Solution by VAM of the following Transportation Problem. (CO3) (6)

|  | W1 | W2 | W3 | W4 | W4 | Supply |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| F1 | 55 | 30 | 40 | 50 | 50 | 40 |
| F2 | 35 | 30 | 100 | 45 | 60 | 20 |
| F3 | 40 | 60 | 95 | 35 | 30 | 40 |
| Demand | 25 | 10 | 20 | 30 | 15 |  |

5. The following table gives the ages and blood pressure of 10 women

| Age(X) | 56 | 42 | 36 | 47 | 49 | 42 | 60 | 72 | 63 | 55 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Blood Pressure(Y) | 147 | 125 | 118 | 128 | 145 | 140 | 155 | 160 | 149 | 150 |

## Determine

(a) Regression line of Y on X
(b) Regression line of X on Y
(c) Correlation coefficient between X and Y
(d) Estimate the blood pressure of a women whose age is 45 years

# Quiz: Digital \& Social Media Marketing (Module I: MM302) Continuous Assessment 3 <br> MBA (New) 3rd ${ }^{\text {rd }}$ Semester (Marketing Specialization) 

## Name:

Score:

## Put a tick $(\sqrt{ })$ to the appropriate options given below for each question (Attempt any 10):-

1. Which of the following would be leveraging both social network and traditional marketing?
a. Handing out print advertisements with a coupon for a store
b. A print advertisement in a magazine which drives people to a website where there is a free trial offer
c. Posting an advertisement on a message board
d. Hosting a video ad on YouTube not otherwise seen elsewhere
2. Social networks are organized primarily around $\qquad$ _.
a. brands
b. people
c. discussions
d. interests
3. Social networks have an enormous information sharing capacity. As such, they are a great distribution channel for
$\qquad$ .
a. customer feedback
b. viral content c. exclusive coupons
d. marketing messages
4. Which social network is considered the most popular for business to business marketing?
a. Facebook
b. Orkut
c. Ryze
d. LinkedIn
5. One advantage a non-profit has when opening a private social network is.
a. its tax exempt status makes the start up cost of a private social network more affordable.
b. its supporters tend to spend more time using social networks.
c. that it has an immediate user base of people interested in the cause.
d. its supporters have a higher tolerance for marketing messages.
6. Larger social networking sites
a. will force niche social networks out of business.
b. set social media trends.
c. are expected to see declining growth rates.
d. are a better fit for most nonprofit organizations.
7. What methods of social network marketing should a company always use?
a. Blogging only
b. Twitter, Blogs, Facebook
c. YouTube
d. Depends on the company, their product, their audience
8. What is the term adopted for updates by Twitter users? | Social Media Marketing mcqs
a. Tweets
b. Twoots
c. Twinks
d. Posts
9. What is "social media optimization"?
a. Creating content which easily creates publicity via social networks
b. Writing clear content
c. Creating short content which is easily indexed
d. Hiring people to create content for social networks
10. Which of the following is valuable in increasing a page rank?
a. Paying for placement
b. Static content
c. Quantity of links from other highly ranked pages to your site
d. No contact information

## Rubric to evaluate Answer script

| Short Answer type Questions |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Elements | $\mathbf{4}$ | $\mathbf{3}$ | $\mathbf{2}$ | $\mathbf{0}$ |  |
| Content | Answers are <br> comprehensive, accurate <br> and complete. | Answers are accurate and <br> complete | Answers are not <br> comprehensive or <br> completely stated | Answers are partial or <br> incomplete | Did not answer question |
| Use of terms | answer included all the <br> terms from the lesson that <br> applied to the question <br> asked. All terms are fully <br> defined and used in the <br> proper context. | answer included several <br> terms from the lesson, <br> demonstrating adequate <br> understanding of the <br> material. | Only few term from the <br> lesson is used in the answer. | No terms from the lesson <br> are used. | Did not answer question |
| Grammar | Punctuation, grammar, <br> usage, and spelling are <br> effectively used throughout. | Minor errors in punctuation, <br> grammar, usage, and <br> spelling are evident,. | Occasional errors in <br> punctuation, grammar, <br> usage, and spelling are <br> evident. | Contains significant errors <br> in punctuation, grammar, <br> usage, and spelling. | Did not answer question |


| Long Answer type Questions |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Elements | $\mathbf{4}$ | $\mathbf{3}$ | $\mathbf{2}$ | $\mathbf{1}$ |  |
| Completeness | response precisely answer <br> each part of the question | response almost answer <br> each part of the question | response misses answer for <br> some part of the question | Answers are partial or <br> incomplete | Did not answer question |
| Knowledge | response shows excellent <br> understanding of the lesson <br> content by correctly <br> defining key definitions, <br> terms and summarizing <br> concepts. | response shows very good <br> understanding of the lesson <br> content by correctly <br> defining key definitions, <br> terms and concepts. | response shows good <br> understanding of the lesson <br> content. | response shows need of <br> understanding of the lesson <br> content. | Did not answer question |
| Grammar | Punctuation, grammar, <br> usage, and spelling are <br> effectively used throughout. | Minor errors in punctuation, <br> grammar, usage, and <br> spelling are evident,. | Occasional errors in <br> punctuation, grammar, <br> usage, and spelling are <br> evident. | Contains significant errors <br> in punctuation, grammar, <br> usage, and spelling. | Did not answer question |


| Numerical type Questions | $\mathbf{3}$ | $\mathbf{2}$ | $\mathbf{0}$ |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Elements | $\mathbf{4}$ | Complete understanding of <br> the problem-identifies all <br> elements of the problem and <br> gives correct answer. | Basic understanding of the <br> problem-identifies most <br> elements of the problem and <br> may or may not give the <br> correct answer. | Limited understanding of <br> the problem-identifies a few <br> elements of the problem and <br> may give the incorrect <br> answer. | No understanding of the <br> problem |
| Computation | All computation is complete <br> \& correct | Computation is generally <br> correct with minor flaws | Computation is incomplete | Computation is incorrect | Did not answer question |

INTERNAL EXAMINATION RESULT
INFROMATION TECHNOLOGY , 4th sem AY:2021-2022

| $\begin{array}{c}\text { PAPER NAME }\end{array}$ |  | $\begin{array}{c}\text { DISCRETE } \\ \text { MATHEMATIC } \\ \text { S }\end{array}$ | $\begin{array}{c}\text { COMPUTER } \\ \text { ARCHITECTU } \\ \text { RE }\end{array}$ | $\begin{array}{c}\text { FOORMAL } \\ \text { LANGUAGE \& } \\ \text { AUTOMATA } \\ \text { THEORY }\end{array}$ | BIOLOGY |
| :---: | :--- | :--- | :---: | :---: | :---: | :---: | :---: | \(\left.\begin{array}{c}DESIGN \& <br>

ANALYSIS OF <br>
ALGORITHM\end{array} $$
\begin{array}{c}\text { ENVIRONME } \\
\text { NTAL } \\
\text { SCIENCES }\end{array}
$$\right]\)

