**K. J. Somaiya Institute of Engineering and Information Technology**
**Sion, Mumbai - 400022**
**NAAC Accredited Institute with 'A' Grade**
**NBA Accredited 3 Programs (Computer Engineering, Electronics & Telecommunication Engineering and Electronics Engineering) Permanently Affiliated to University of Mumbai**

**EXAMINATION TIME TABLE (June 2021)**

## T.E.(ELECTRONICS)(Sem VI)(REV. -2016)(Choice Based)

| Days and Dates | Time | Course Code | Paper |
|---|---|---|---|
| Wednesday, June 02, 2021 | 11.30 a.m. to 1.30 p.m. | ELX601 | Embedded System and RTOS |
| Friday, June 04, 2021 | 11.30 a.m. to 1.30 p.m. | ELX 602 | Computer Communication Network |
| Monday, June 07, 2021 | 11.30 a.m. to 1.30 p.m. | ELX 603 | VLSI Design |
| Wednesday, June 09, 2021 | 11.30 a.m. to 1.30 p.m. | ELX 604 | Signals and systems |
| Friday, June 11, 2021 | 11.30 a.m. to 1.30 p.m. | ELXDLO6021 | Department Level Optional courses II:- Microwave Engineering |
| Friday, June 11, 2021 | 11.30 a.m. to 1.30 p.m. | ELXDLO6022 | Electronics Product Design |
| Friday, June 11, 2021 | 11.30 a.m. to 1.30 p.m. | ELXDLO6023 | Wireless Communication |
| Friday, June 11, 2021 | 11.30 a.m. to 1.30 p.m. | ELXDLO6024 | Computer Organization and Architecture |

Change if any, in the time table shall be communicated on the college web site.

Mumbai
Wednesday,May 12, 2021

**Principal**

# University of Mumbai
## Examination 2021 under Cluster 06
## (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELX601 and Course Name: Embedded Systems and Real Time Operating System

Time: 2 hour Max. Marks: 80

==========

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | _____circuit prevents the processor/controller from unexpected program execution behavior when the supply voltage to the processor/controller falls below a specified voltage. |
| Option A: | Reset |
| Option B: | Brown out protection |
| Option C: | Watchdog |
| Option D: | Programmable Peripheral Interface |
| | |
| 2. | A _____is a computer program that operates or controls a particular type of device that is attached to a computer. |
| Option A: | device disk |
| Option B: | ISR |
| Option C: | device driver |
| Option D: | IPC |
| | |
| 3. | In Black Box Testing, the tester_____ |
| Option A: | is not knowing the internal architecture or structure/techniques of the functional block to be tested. |
| Option B: | is fully aware the internal architecture or structure/techniques of the functional block to be tested. |
| Option C: | is independent and has no idea of data, requirements or specifications. |
| Option D: | is not required. |
| | |
| 4. | The smart card reader communicates with a desktop machine by implementing a communication channel using _____ |
| Option A: | RS-232 C |
| Option B: | ZigBee |
| Option C: | GPRS |
| Option D: | RS-485 |
| | |
| 5. | The most important phase in software life cycle is |
| Option A: | Integration |
| Option B: | Design |

| | |
|---|---|
| Option C: | Testing |
| Option D: | Debugging |
| | |
| 6. | _____is a timing device that resets the system after a predefined timeout |
| Option A: | Real time clock |
| Option B: | Reset circuit |
| Option C: | Watchdog timer |
| Option D: | Power down mode |
| | |
| 7. | _____is fast in operation due to its resistive networking and switching capabilities |
| Option A: | NVRAM |
| Option B: | DRAM |
| Option C: | SRAM |
| Option D: | RAM |
| | |
| 8. | _____is a term used to describe a situation when a higher priority task cannot execute because it is waiting for a low priority task to complete. |
| Option A: | IPC |
| Option B: | Priority Inheritance Protocol |
| Option C: | Priority Inversion |
| Option D: | Priority Ceiling |
| | |
| 9. | The two common kinds of semaphores are_____ |
| Option A: | Binary and Counting |
| Option B: | Primary and Secondary |
| Option C: | Signal and Pipe |
| Option D: | Single and Mailbox |
| | |
| 10. | _____is used to acquire semaphore in uCOS-II. |
| Option A: | OSSemPost( ) |
| Option B: | OSSemphore ( ) |
| Option C: | OSSemAcq ( ) |
| Option D: | OSSemPend( ) |
| | |
| 11. | The fundamental building blocks of UML are _____ |
| Option A: | Structure and behaviour |
| Option B: | Things, relationships and diagrams |
| Option C: | Objects and classes |
| Option D: | Use case and sequence diagrams |
| | |
| 12. | Which of the following is one-time programmable memory? |
| Option A: | SRAM |
| Option B: | PROM |
| Option C: | FLASH |
| Option D: | NVRAM |

| | |
|---|---|
| | |
| 13. | Which of the following are the three measures of information security in embedded systems? |
| Option A: | Confidentiality, secrecy, integrity |
| Option B: | Confidentiality, integrity, availability |
| Option C: | Confidentiality, transparency, availability |
| Option D: | Integrity, transparency, availability |
| | |
| 14. | A situation where none of the processes are able to make any progress in their execution is termed as |
| Option A: | Deadlock |
| Option B: | Livelock |
| Option C: | Starvation |
| Option D: | Racing |
| | |
| 15. | The state where a process is incepted into the memory and awaiting the processor time for execution is known as |
| Option A: | Ready State |
| Option B: | Blocked State |
| Option C: | Waiting State |
| Option D: | Created State |
| | |
| 16. | The ability of an operating system to hold multiple process in memory and switch the processor (CPU) from executing one process to another process is called |
| Option A: | Multitasking |
| Option B: | Multiprocessing |
| Option C: | Multiprogramming |
| Option D: | Multithreading |
| | |
| 17. | _____is a sleep and wakeup based mutual exclusion implementation for shared resource access |
| Option A: | Mutex |
| Option B: | Remote Procedure call |
| Option C: | Semaphore |
| Option D: | Racing |
| | |
| 18. | Which is the function call used by an ISR to indicate the occurrence of an interrupt to the MicroC/OS-II Kernel |
| Option A: | Interrupt |
| Option B: | OSIntEnter |
| Option C: | OSIntExit |
| Option D: | OSIdle |
| | |
| 19. | RS 232 is not suitable for _____ communications. |
| Option A: | Point to Point |
| Option B: | Multi Drop |
| Option C: | 2 Wire communication |
| Option D: | Mesh network |
| | |

| | |
|---|---|
| 20. | _____is not a task type. |
| Option A: | Periodic |
| Option B: | Sporadic |
| Option C: | Priority Inversion |
| Option D: | Aperiodic |

| **2**<br>**(20 Marks)** | **Solve any Two Questions out of Three** **10 marks each** |
|---|---|
| A | What is the role of sensor and transducer in Embedded System design? Illustrate with an example. |
| B | Explain the different types of UML diagram and their significance in each stage of the system development life cycle. |
| C | Explain Rate Monotic Scheduling Algorithm; State its advantages and disadvantages. |

| **Q Q3.**<br>**(20 Marks)** | **Solve any Two Questions out of Three** **10 marks each** |
|---|---|
| A | Design a Car Cruise-control using uCOS II RTOS. Support the design with requirements, hardware and software architecture. |
| B | Write a short not on: Hardware-Software Co-design |
| C | What are the different types of Inter-process communication? Explain any two in detail. |

# University of Mumbai
# Examination 2021 under Cluster 06
# (Lead College: Vidyavardhini's College of Engg Tech)

**Examination Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELX601 and Course Name: Embedded Systems and RTOS

Time: 2 hour Max. Marks: 80

==========

**Q1:**

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

# University of Mumbai
# Examination 2021 under Cluster 06
# (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code:ELX602 and Course Name: Computer Communication and Networks

Time: 2 hour Max. Marks: 80

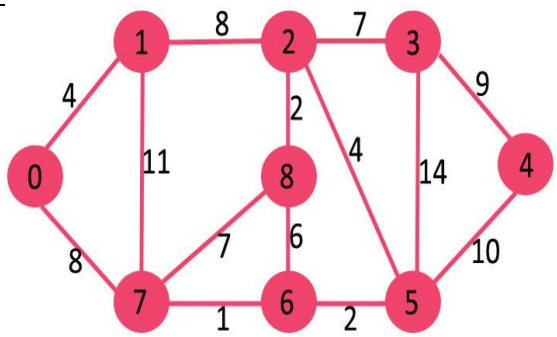
==========

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | We add r redundant bits to each block to make the length n = k + r. The resulting n-bit blocks are called _____ |
| Option A: | Blockword |
| Option B: | Dataword |
| Option C: | Code word |
| Option D: | Word |
| | |
| 2. | Which error detection method uses one's complement arithmetic? |
| Option A: | Simple parity check |
| Option B: | CRC |
| Option C: | Two-dimensional parity check |
| Option D: | Checksum |
| | |
| 3. | Automatic repeat request error management mechanism is provided by _____. |
| Option A: | logical link control sublayer |
| Option B: | media access control sublayer |
| Option C: | network interface control sublayer |
| Option D: | application access control sublayer |
| | |
| 4 | In PURE ALOHA, vulnerable time is _____frame transmission time. |
| Option A: | the same as |
| Option B: | two times |
| Option C: | three times |
| Option D: | four times |
| | |
| 5. | Devices in a ring or mesh topology are usually configured in a _____relationship |
| Option A: | Peer to peer |
| Option B: | Point to Point |
| Option C: | primary to secondary |
| Option D: | Master & slave |
| | |
| 6. | In a mesh topology with n devices, if a new device is added, _____new links are needed. |
| Option A: | n |

| | |
|---|---|
| Option B: | n-1 |
| Option C: | n+1 |
| Option D: | 2n |
| | |
| 7. | A device that helps prevent congestion and data collisions is _____. |
| Option A: | Switch |
| Option B: | Hub |
| Option C: | Gateway |
| Option D: | Proxy Server |
| | |
| 8. | In the Ethernet frame, the _____ field contains error detection information. |
| Option A: | Address |
| Option B: | Preamble |
| Option C: | CRC |
| Option D: | Type |
| | |
| 9. | In the Ethernet, the _____field is actually added at the physical layer and is not (formally) the part of the frame. |
| Option A: | address |
| Option B: | CRC |
| Option C: | Preamble |
| Option D: | Type of protocol |
| | |
| 10. | The MAC (Media Access Control) address of the network card is used in both Ethernet and Token-Ring networks and is essential for communication. What does MAC provide? |
| Option A: | An alias for the computer name. |
| Option B: | The logical domain address for the workstation. |
| Option C: | A physical address that is assigned by the manufacturer. |
| Option D: | A physical address that is randomly assigned each time the computer is started. |
| | |
| 11. | An address in a block is 180.8.17.9. Find the first address and last address in the block. |
| Option A: | 180.8.0.0 and 180.8.255.255 |
| Option B: | 180.8.1.0 and 180.8.255.0 |
| Option C: | 180.8.1.1 and 180.8.255.255 |
| Option D: | 180.8.0.0 and 180.8.1.1 |
| | |
| 12. | Prefix length in classless addressing can be _____. |
| Option A: | 1 to16 |
| Option B: | 1 to 32 |
| Option C: | 1 to 24 |
| Option D: | 1 to 8 |
| | |
| 13. | What is the SUBNET mask for a class C Network? |
| Option A: | 255.0.0.0 |
| Option B: | 255.255.255.0 |
| Option C: | 255.255.0.0 |

| | |
|---|---|
| Option D: | 255.255.255.255 |
| | |
| 14. | Which of the following is the Protocol of Application layer ? |
| Option A: | TCP |
| Option B: | UDP |
| Option C: | SCTP |
| Option D: | DNS |
| | |
| 15. | To deliver a message to the correct application program running on a host, the _____ address must be consulted. |
| Option A: | IP |
| Option B: | MAC |
| Option C: | Port |
| Option D: | Physical |
| | |
| 16. | What is the hexadecimal equivalent of the Ethernet address 01011010 00010001 01010101 00011000 10111010 11111111? |
| Option A: | 5A:88:AA:18:55:F0 |
| Option B: | 5A:81:BA:81:AA:0F |
| Option C: | 5A:18:5A:18:55:0F |
| Option D: | 5A:11:55:18:BA:FF |
| | |
| 17. | User datagram protocol is called connectionless because _____ |
| Option A: | all UDP packets are treated independently by transport layer |
| Option B: | it sends data as a stream of related packets |
| Option C: | it is received in the same order as sent order |
| Option D: | it sends data very quickly |
| | |
| 18. | Which connector does the STP cable use? |
| Option A: | BNC |
| Option B: | RJ-11 |
| Option C: | RJ-45 |
| Option D: | RJ-69 |
| | |
| 19. | The default connection type used by HTTP is _____ |
| Option A: | Persistent |
| Option B: | Non-persistent |
| Option C: | Can be either persistent or non-persistent depending on connection request |
| Option D: | reference request |
| | |
| 20. | Simple mail transfer protocol (SMTP) utilizes _____ as the transport layer protocol for electronic mail transfer. |
| Option A: | TCP |
| Option B: | UDP |
| Option C: | IP |
| Option D: | SCTP |

| Q.2 | **Solve any Two Questions out of Three.** **(10 marks each)** |
|---|---|
| A | What are the functions of layers in the OSI model? |
| B | Classify the various multiple access methods and explain CSMA-CD in detail. |
| C | What is traffic shaping? Explain leaky bucket technique and Token Bucket technique of traffic shaping. |

| Q.3 | **Solve any Two Questions out of Three.** **(10 marks each)** |
|---|---|
| A | Define the utilization or efficiency of the line and derive the expression for stop and wait flow control. Calculate the maximum link utilization for following cases:<br>i)stop and wait flow control<br>ii) Sliding window flow control with window sizes of 4 & 7<br>Link specification:<br>Frame length=5000 bits/frame<br>Velocity of propagation= 2x10^8 m/s, Link distance=30km, Data rate=50 Mbps |
| B |  <br><br>Using Dijkstra's shortest path algorithm, find the shortest path |
| C | An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets as shown below:<br>❑ One subblock of 120 addresses.<br>❑ One subblock of 60 addresses.<br>❑ One subblock of 10 addresses<br>From above information, design the subnetworks and find the information about each network. |

# University of Mumbai
# Examination 2021 under Cluster 06
# (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code:ELX602 and Course Name: Computer Communication and Networks

Time: 2 hour Max. Marks: 80

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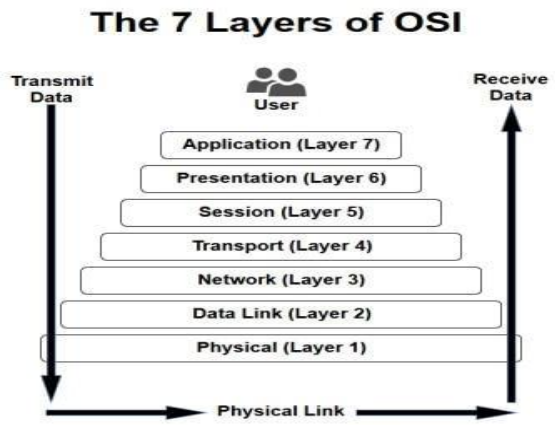
**Q1:**

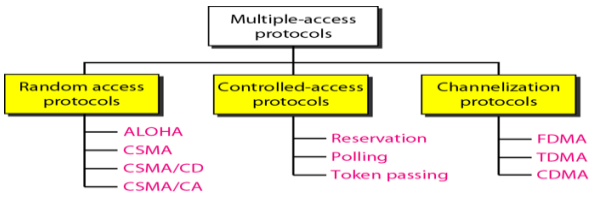
| Question Number | Correct Option (Enter either 'A' or 'B' or 'C' or 'D') |
|---|---|
| Q1. | C |
| Q2. | A |
| Q3. | A |
| Q4 | B |
| Q5 | A |
| Q6 | B |
| Q7 | A |
| Q8. | C |
| Q9. | C |
| Q10. | C |
| Q11. | A |
| Q12. | B |
| Q13. | B |
| Q14. | D |
| Q15. | C |
| Q16. | D |
| Q17. | A |
| Q18.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

**Important steps and final answer for the questions involving numerical example**

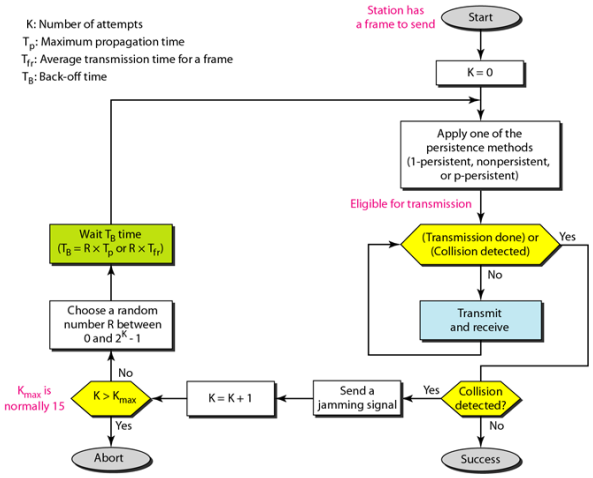
Q2(A): What are the functions of layers in the OSI model?



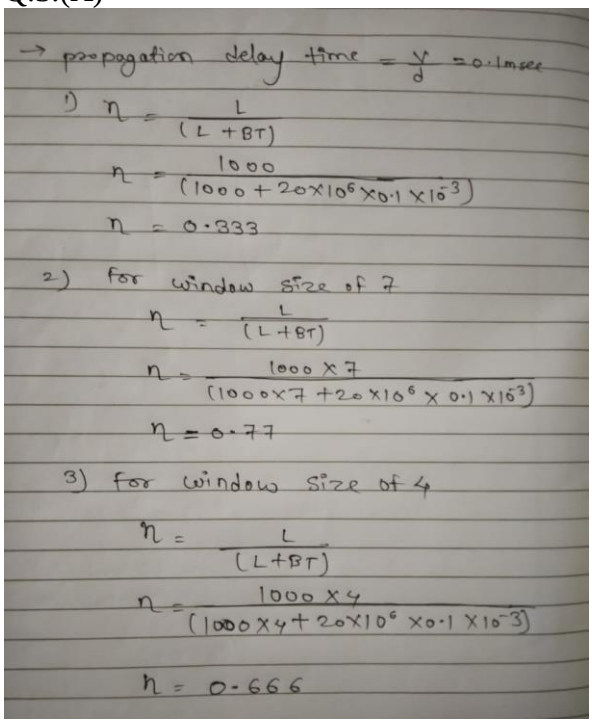

**Q.2(B):** Classify the various multiple access methods and explain CSMA-CD in detail.



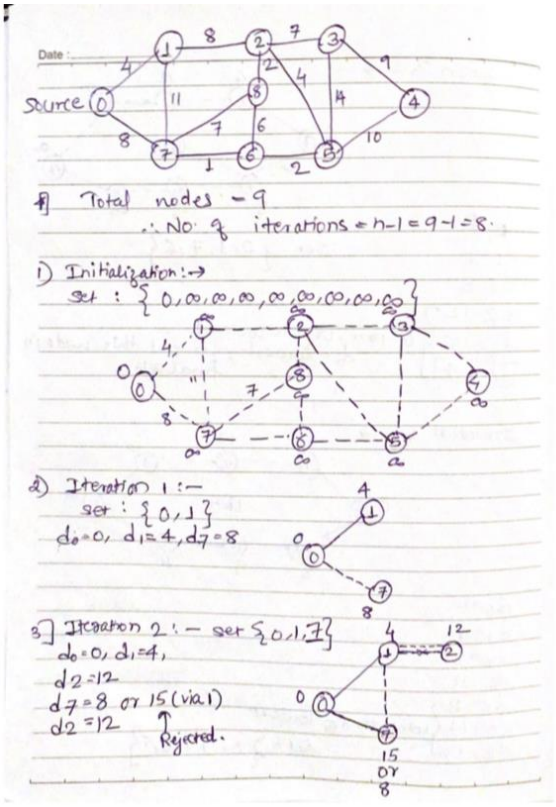

***Flow diagram for the CSMA/CD is as follows:***

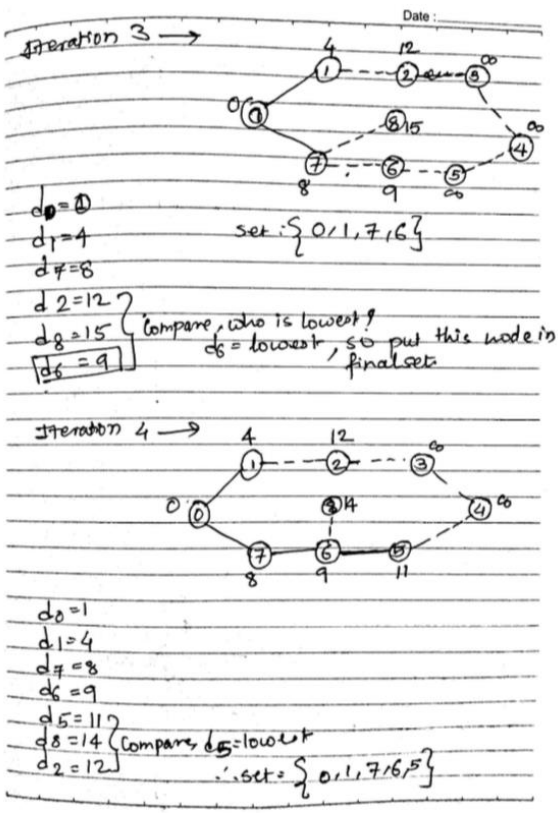

K: Number of attempts
$T_p$: Maximum propagation time
$T_{fr}$: Average transmission time for a frame
$T_B$: Back-off time
Station has a frame to send
Start
K = 0
Apply one of the persistence methods (1-persistent, nonpersistent, or p-persistent)
Eligible for transmission
(Transmission done) or (Collision detected)
Yes
No
Transmit and receive
Wait $T_B$ time ($T_B = R \times T_p$ or $R \times T_{fr}$)
Choose a random number R between 0 and $2^K - 1$
$K_{max}$ is normally 15
$K > K_{max}$
No
Yes
Abort
K = K + 1
Send a jamming signal
Collision detected?
Yes
No
Success

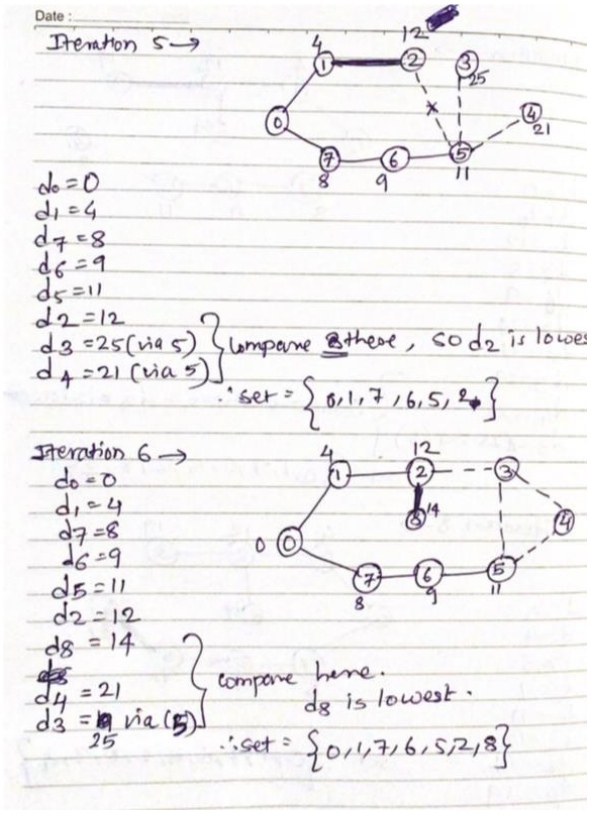
Q.3.(A)

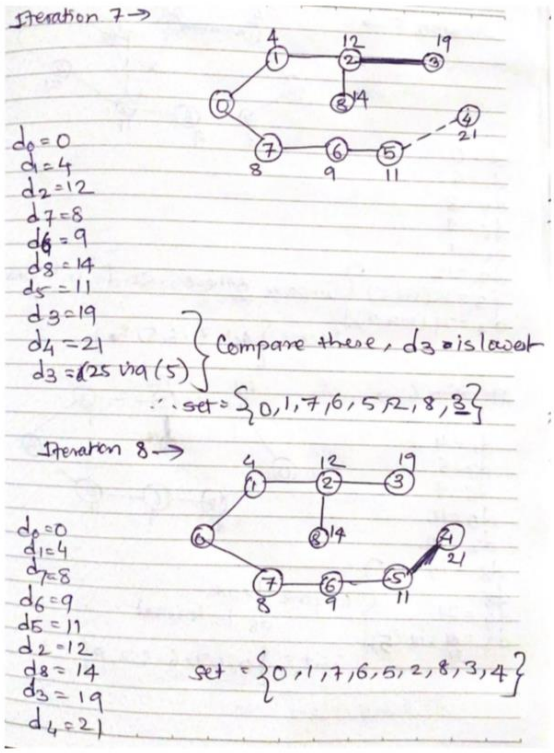

→ propagation delay time = $\frac{V}{d}$ = 0.1msec
1) $\eta = \frac{L}{(L + BT)}$
$\eta = \frac{1000}{(1000 + 20 \times 10^6 \times 0.1 \times 10^{-3})}$
$\eta = 0.333$
2) for window size of 7
$\eta = \frac{L}{(L + BT)}$
$\eta = \frac{1000 \times 7}{(1000 \times 7 + 20 \times 10^6 \times 0.1 \times 10^{-3})}$
$\eta = 0.77$
3) for window size of 4
$\eta = \frac{L}{(L + BT)}$
$\eta = \frac{1000 \times 4}{(1000 \times 4 + 20 \times 10^6 \times 0.1 \times 10^{-3})}$
$\eta = 0.666$

Q.3.(B)


Date :
Source
Total nodes = 9
∴ No. of iterations = n-1 = 9-1 = 8.
1) Initialization :→
Set : {0, ∞, ∞, ∞, ∞, ∞, ∞, ∞, ∞}
2) Iteration 1 :–
set : {0, 1}
$d_0 = 0$, $d_1 = 4$, $d_7 = 8$
3] Iteration 2 :– set {0, 1, 7}
$d_0 = 0$, $d_1 = 4$,
$d_2 = 12$
$d_7 = 8$ or 15 (via 1)
$d_2 = 12$
Rejected.
15 OR 8


Date :
Iteration 3 →
$d_0 = 0$
$d_1 = 4$
$d_7 = 8$
$d_2 = 12$
$d_8 = 15$
$d_6 = 9$
Compare, who is lowest ?
$d_6$ = lowest, so put this node in final set.
set : {0, 1, 7, 6}
Iteration 4 →
$d_0 = 1$
$d_1 = 4$
$d_7 = 8$
$d_6 = 9$
$d_5 = 11$
$d_8 = 14$
$d_2 = 12$
Compare, $d_5$ = lowest
∴ set = {0, 1, 7, 6, 5}




Q.3(C)

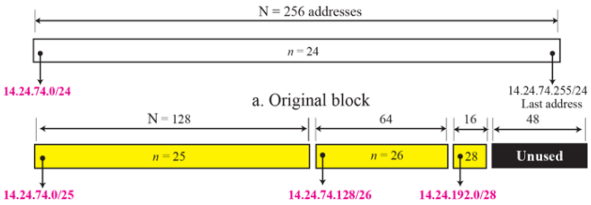
There are $2^{32 - 24}$ = 256 addresses in this block. The first address is 14.24.74.0/24; the last address is 14.24.74.255/24.

a. The number of addresses in the first subblock is not a power of 2. We allocate 128 addresses. The subnet mask is 25. The first address is 14.24.74.0/25; the last address is 14.24.74.127/25.

b. The number of addresses in the second subblock is not a power of 2 either. We allocate 64 addresses. The subnet mask is 26. The first address in this block is 14.24.74.128/26; the last address is 14.24.74.191/26.

c. The number of addresses in the third subblock is not a power of 2 either. We allocate 16 addresses. The subnet mask is 28. The first address in this block is 14.24.74.192/28; the last address is 14.24.74.207/28.

d. If we add all addresses in the previous subblocks, the result is 208 addresses, which means 48 addresses are left in reserve. The first address in this range is 14.24.74.209. The last address is 14.24.74.255.




b. Subblocks

# University of Mumbai

## Examination 2021 under Cluster 06

## (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

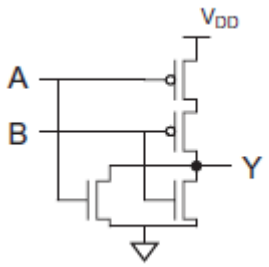
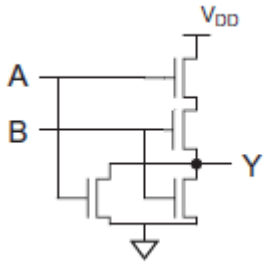
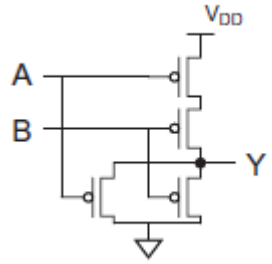
Curriculum Scheme: Rev 2016

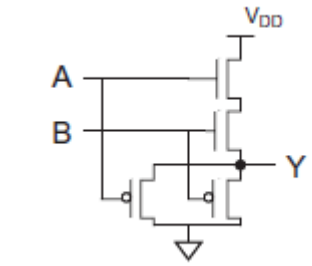
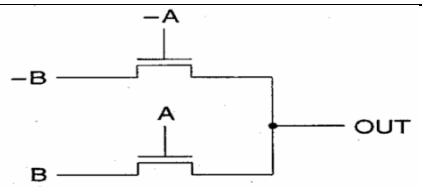
Examination: TE Semester VI

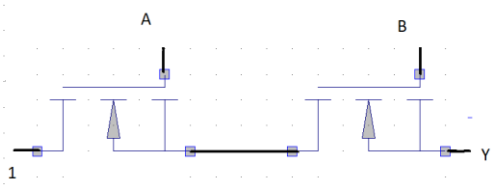
Course Code: ELX603 Course Name:VLSI Design

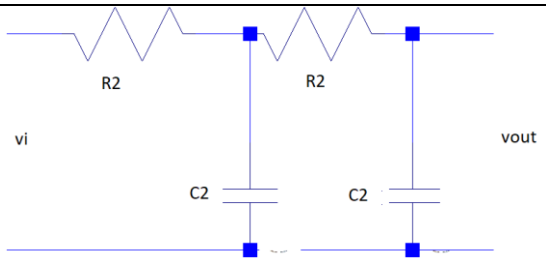
Time: 2 hour Max. Marks: 80

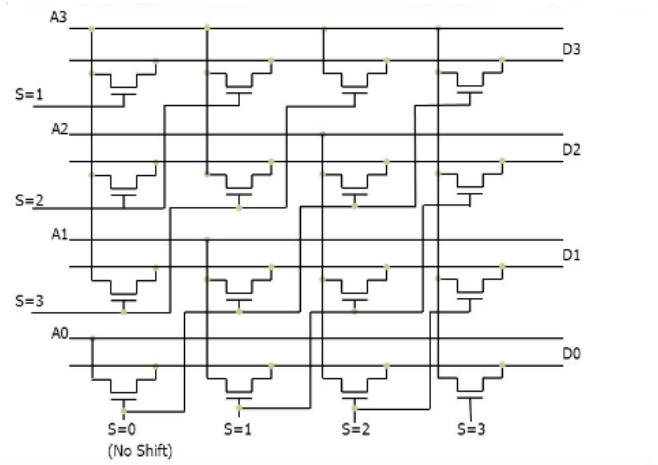
==========

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | The CMOS logic circuit for NOR gate is: |
| Option A: |  |
| Option B: |  |
| Option C: |  |

| | |
|---|---|
| Option D: |  |
| | |
| 2. | In Pseudo-nMOS inverter logic, the gate of pmos transistor operates is: - |
| Option A: | Connected to VDD |
| Option B: | grounded |
| Option C: | Connected to gate of nmos transistor |
| Option D: | Kept floated |
| | |
| 3. |  <br>(-A indicates complement of A and –B indicates complement of B) Above Circuit is |
| Option A: | XNOR |
| Option B: | XOR |
| Option C: | AND |
| Option D: | OR |
| | |
| 4. | Sense amplifiers are primarily used in: - |
| Option A: | Memory circuits |
| Option B: | Adder Circuits |
| Option C: | Manchester carry chain adders |
| Option D: | Operational Amplifier |
| | |
| 5. | In 6 T SRAM Cell the core is made up of how many inverters |
| Option A: | 4 |
| Option B: | 2 |
| Option C: | 5 |
| Option D: | 6 |
| | |
| 6. | The capacitance used in 1 T DRAM cell is: - |
| Option A: | Normal Electrolytic Capacitor |
| Option B: | Diffusion Capacitance |
| Option C: | MOSFET capacitance |
| Option D: | Trench Capacitance |
| | |
| 7. | When a CMOS inverter withdraws maximum current from the supply, the two transistors are in _____ region. |
| Option A: | saturation |
| Option B: | linear |
| Option C: | non saturation |

| | |
|---|---|
| Option D: | cut-off |
| | |
| 8. | The Manchester Carry-Chain Adder is having a part of ---------- transistors that are used to implement the carry chain. |
| Option A: | PASS |
| Option B: | PNP |
| Option C: | NPN |
| Option D: | BJT |
| | |
| 9. | For the body effect to occur in a MOSFET, substrate is biased with respect to _____ |
| Option A: | Gate |
| Option B: | Drain |
| Option C: | Source |
| Option D: | Body |
| | |
| 10. | Ids is _____ to length L of the channel. |
| Option A: | Square law |
| Option B: | Logarithmically |
| Option C: | Directly Proportional |
| Option D: | Inversely Proportional |
| | |
| 11. |  <br>The circuit shows two pass transistors in series. Find the value of Y? |
| Option A: | Y=A.B |
| Option B: | Y=A+B |
| Option C: | Y=A.A |
| Option D: | Y=B.B |
| | |
| 12. | ESD phenomenon stands for |
| Option A: | Electron Source Detection |
| Option B: | Electron Static Discharge |
| Option C: | Electrostatic Discharge |
| Option D: | Discharged Capacitor |
| | |
| 13. | The device in which NMOS and PMOS pair wired in parallel with their sources connected and drains connected is called as |
| Option A: | Transmission Gate |
| Option B: | CMOS inverter |
| Option C: | Pseudo NMOS inverter |
| Option D: | Manchester circuit |
| | |
| 14. | H-tree Distribution to all chip level circuits is used to avoid following error: - |
| Option A: | Clock skew |
| Option B: | Clock jitter |
| Option C: | Charge sharing |

| | |
|---|---|
| Option D: | Charge leakage |
| | |
| 15. | Charge Sharing and Charge Leakage Problem in Domino cascade circuits can be removed by |
| Option A: | Dynamic Circuit |
| Option B: | Single FET charge keeper circuit. |
| Option C: | Static CMOS Circuit |
| Option D: | Clocked CMOS circuits. |
| | |
| 16. | The refresh frequency in DRAM cell is |
| Option A: | $f_{refresh}=1/2t_h$ |
| Option B: | $f_{refresh}=1/3t_h$ |
| Option C: | $f_{refresh}=1/t_h$ |
| Option D: | $f_{refresh}=1/4t_h$ |
| | |
| 17. |  <br>For the above circuit vi is the input voltage ,vout is the output voltage of the circuit. By Elmore's formula find out the time constant of the circuit. |
| Option A: | $R_2C_2$ |
| Option B: | $3R_2C_2$ |
| Option C: | $4R_2C_2$ |
| Option D: | $2R_2C_2$ |
| | |
| 18. | When Kn>Kp ,Threshold voltage of CMOS Inverter move closer to |
| Option A: | Zero |
| Option B: | Infinity |
| Option C: | Midpoint Value |
| Option D: | Supply Voltage |
| | |
| 19. | In Integrated Chips circuits are connected to each other mostly by: - |
| Option A: | connection |
| Option B: | Interconnect |
| Option C: | wires |
| Option D: | PCB |
| | |
| 20. | Find the name of below diagram |

| | |
|---|---|
| |  |
| Option A: | ROM Memory |
| Option B: | RAM Memory |
| Option C: | Barrel Shifter |
| Option D: | NAND ROM Memory |

## subjective/descriptive questions

| **Q2**<br>**(20 Marks)** | **Solve any Four out of Six** **5 marks each** |
|---|---|
| A | What is Scaling in VLSI Technology? List the types of scaling and explain any one in detail. |
| B | Explain CMOS inverter characteristics mentioning it's all regions of operation. |
| C | Implement Z= $\overline{(A+B+C)\,DE}$ using CMOS static circuit. |
| D | Draw Schematic of 6T SRAM Cell and Explain it's working |
| E | Compare pass transistor and transmission gate, list two advantages of transmission gate. |
| F | Write short note on Importance of low power design in VLSI circuits. |

| **Q3.**<br>**(20 Marks Each)** | |
|---|---|
| A | **Solve any Two out of Three** **5 marks each** |
| i. | Write short note on Interconnect scaling and crosstalk of the interconnect. |
| ii. | Draw J-K Flipflop using CMOS and explain its operation. |
| iii. | Explain concept of precharge and evaluation in Dynamic CMOS circuits |
| B | **Solve any One out of Two** **10 marks each** |
| i. | Consider a CMOS Inverter circuit with following parameters<br>VTO,n=0.6 v , VTO,p= -0.7v<br>$\mu nCox=60\ \mu A/V^{2,}$ (W/L) n=8<br>$\mu pCox=25\ \mu A/V^{2,}$ (W/L) p=12<br>Calculate noise margin, If the power supply voltage VDD=3.3v |
| ii. | Compare Ripple carry adder and Carry Lookahead adder, Explain 4-bit CLA adder circuit. |

# University of Mumbai
## Examination 2021 under Cluster 06
## (Lead College: Vidyavardhini's College of Engg Tech)

**Examination Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELX603 Course Name:VLSI Design

Time: 2 hour Max. Marks: 80

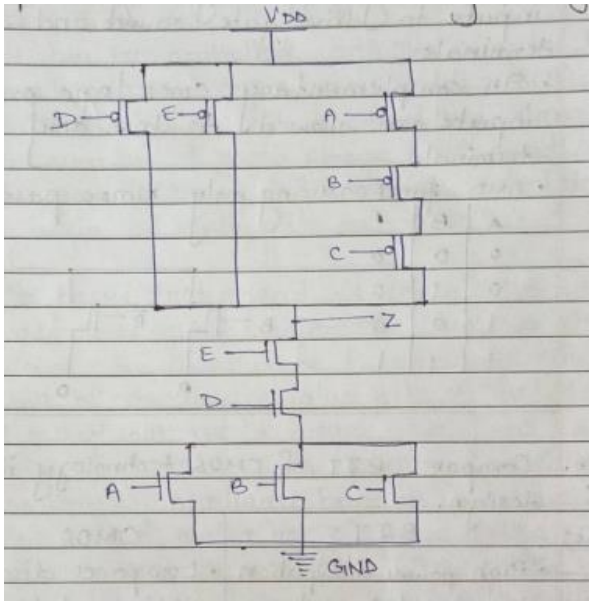
==========

**Q1:**

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

**Important steps and final answer for the questions involving numerical example**

**Q2(C)**



# Q3[(B-i)]:

$V_{OH}$ $V_{in} = 0 \rightarrow$ NMOS in cut-off,

$V_{GS,p} > V_{TO,p}$ conducts but no current then there is no voltage drop at $V_{DS,p} \rightarrow V_{out} = \underline{V_{OH} = 3.3\ V}$

$V_{OL}$ assume $V_{IN} = V_{OH} = V_{DD} = 3.3$ V, then NMOS is linear bc $V_{DS,n} < (V_{GS,n} - V_{TO,n})$

PMOS is in saturation

Then $I_{DN} = \frac{\mu_n C_{ox}}{2}\frac{W_n}{L}[2(3.3-0.6)V_{OL} - V_{OL}^2]$ and $I_{DP} = \frac{\mu_p C_{ox}}{2}\frac{W_p}{L}(|-3.3| - |-0.7|)^2$

$I_{DN} = I_{DP} \rightarrow V_{OL}^2 - 5.4V_{OL} + 0.69 = 0$ $\underline{V_{OL} = 0.13\ V}$

$V_{IL}$ $V_{in} = V_{IL}$ then NMOS $\rightarrow V_{DS} > (V_{GS} - V_{t0})$ saturation

PMOS $\rightarrow$ linear region

$\frac{\mu_n C_{ox}}{2}\frac{W_n}{L}(V_{IL} - 0.6)^2 = \frac{\mu_p C_{ox}}{2}\frac{W_p}{L}[2(3.3 - |-0.7|)(V_{out} - 3.3) - (V_{out} - 3.3)^2]$

$\frac{60}{25}\frac{W_n}{W_p}(V_{IL} - 0.6)^2 = -5.2(V_{out} - 3.3) - (V_{out} - 3.3)^2$

$9.79[2(V_{IL} - 0.6)] = -5.2\left(\frac{\partial V_{out}}{\partial V_{in}}\right)^{-1} - 2\left(\frac{\partial V_{out}}{\partial V_{in}}\right)^{-1}(V_{out} - 3.3)$, $\underline{V_{out} = 9.79V_{IL} - 5.175}$

$9.79(V_{IL} - 0.6)^2 = -5.2(9.79V_{IL} - 5.175 - 3.3) - (9.79V_{IL} - 5.175 - 3.3)^2$

$105.63V_{IL}^2 - 126.78V_{IL} + 31.28 = 0$ $\underline{V_{IL} = 0.85\ V}$

$V_{IH}$ $V_{in}$=$V_{IH}$ then NMOS $\rightarrow$ $V_{DS}\ !> V_{GS} - V_t$ linear

PMOS $\rightarrow$ $V_{DS} > V_{GS} - V_t$ saturation

$\frac{\mu_n C_{ox}}{2}\frac{W_n}{L}[2(V_{IH} - 0.6)V_{out} - V_{out}^2] = \frac{\mu_p C_{ox}}{2}\frac{W_p}{L}(3.3 - 0.7)^2$

$2(V_{IH} - 0.6)V_{out} - V_{out}^2 = \frac{25}{60}\frac{1}{4.08}6.76$

$2V_{out} + 2(V_{IH} - 0.6)\left(\frac{\partial V_{out}}{\partial V_{in}}\right)^{-1} - 2V_{out}\left(\frac{\partial V_{out}}{\partial V_{in}}\right)^{-1} = 0$ $V_{out} = 0.5V_{IH} - 0.3$

$2(V_{IH} - 0.6)(0.5V_{IH} - 0.3) - (0.5V_{IH} - 0.3)^2 = 0.69$

$0.75V_{IH}^2 - 0.9V_{IH} - 0.42 = 0$ $V_{IH} = 1.56$ V

$$\boxed{\begin{aligned} NM_L &= V_{IL} - V_{OL} = 0.72\ V \\ NM_H &= V_{OH} - V_{IH} = 1.74\ V \end{aligned}}$$

# University of Mumbai
## Examination 2021 under Cluster 06
## (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELX 604 and Course Name: Signals and Systems

Time: 2 hour Max. Marks: 80

==========

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | Determine the signal is periodic or not. If a signal is periodic, specify it's fundamental period of signal $x(n) = e^{j7\pi n}$ |
| Option A: | x(n) is an Aperiodic signal |
| Option B: | x(n) is Periodic with fundamental period N=2 samples/cycle |
| Option C: | x(n) is Periodic with fundamental period N=7 samples/cycle |
| Option D: | x(n) is Periodic with fundamental period N=14 samples/cycle |
| | |
| 2. | What is the area of a Unit Impulse function? |
| Option A: | Zero |
| Option B: | Half of Unity |
| Option C: | Depends on the function |
| Option D: | Unity |
| | |
| 3. | Convolution of the sequences of $x_1(n) = x_2(n)=\{1,1,1\}$? |
| Option A: | {1,1,1,1} |
| Option B: | {1,2,3,2,1} |
| Option C: | {1,2,3,1} |
| Option D: | {1,2,2,1} |
| | |
| 4. | A discrete-time system with input x(n) and y(n) related by y(n) = n[x(n)] |
| Option A: | linear ,time varying, and stable |
| Option B: | non-linear,time invariant, and unstable |
| Option C: | non-linear, time varying, and stable |
| Option D: | linear, time varying, and unstable |
| | |
| 5. | What is the Nyquist rate of the following signal<br>$x(t)= 3\cos(50\pi t) + 10\sin(300\pi t) - \cos(100\pi t)$ ? |
| Option A: | 50 Hz |
| Option B: | 100 Hz |
| Option C: | 200 Hz |
| Option D: | 300Hz |
| | |

| | |
|---|---|
| 6. | What is the condition for causality in Laplace domain? |
| Option A: | ROC should be to the right of right most pole |
| Option B: | ROC should be to the right of right most zero |
| Option C: | ROC should be to the right of left most pole |
| Option D: | All the zeros should be in the right half of the s plane |
| | |
| 7. | Which type of system response to its input represents the zero value of its initial condition? |
| Option A: | Zero state response |
| Option B: | Zero input response |
| Option C: | Total response |
| Option D: | Natural response |
| | |
| 8. | What is the z-transform of x(n-1) if x(n) has z-transform X(Z)? |
| Option A: | ZX(Z) |
| Option B: | [-X(Z)] [Z^1] |
| Option C: | [ X(-Z)] [ Z^(-1)] |
| Option D: | [X(Z)] [Z^(-1)] |
| | |
| 9. | A finite- length signal has X (z) = 0.5+0.2 $z^{-1}$ + 0.7 $z^{-2}$ +0.5 $z^{-3}$ ; its ROC is |
| Option A: | The entire z – plane except z = 0 |
| Option B: | Outside the unit circle |
| Option C: | Inside the unit circle |
| Option D: | On the unit circle |
| | |
| 10. | The convolution property of the z–transforms states that the inverse z – transform of H (z) X (z) is given by |
| Option A: | $\sum_{k=0}^{n-1} h(k)x(n-k)$ |
| Option B: | $\sum_{k=0}^{\infty} h(k)x(k-n)$ |
| Option C: | $\sum_{k=-\infty}^{\infty} h(k)x(n-k)$ |
| Option D: | $\sum_{k=-\infty}^{0} h(n-k)x(n)$ |
| | |
| 11. | Find the Laplace Transform of x (t) = u (t) – u (t –a) |
| Option A: | $\frac{1-e^{as}}{s}$ |
| Option B: | $\frac{1}{s-a}$ |
| Option C: | $\frac{1-e^{-as}}{s}$ |

| | |
|---|---|
| Option D: | $\frac{1}{s+a}$ |
| | |
| 12. | Find the initial and final values for the following function $X(s) = \frac{s+5}{s^2+3s+2}$ |
| Option A: | initial value =0 and final value= 1 |
| Option B: | initial value =1 and final value= 0 |
| Option C: | initial value = 5 and final value= 3 |
| Option D: | initial value = 3 and final value= 5 |
| | |
| 13. | The trigonometric Fourier series of a periodic time function can have only _____ |
| Option A: | Only cosine terms |
| Option B: | Only sine terms |
| Option C: | Both cosine and sine terms |
| Option D: | Dc and cosine terms |
| | |
| 14. | Which among the below mentioned transform pairs is/are formed between the auto-correlation function and the energy spectral density, in accordance to the property of Energy Spectral Density (ESD)? |
| Option A: | Laplace Transform |
| Option B: | Z-Transform |
| Option C: | Fourier Transform |
| Option D: | Wavelet Transform |
| | |
| 15. | The Fourier transform of the signal $\delta(t+1) + \delta(t-1)$ is _____ |
| Option A: | $2/(1 + j\omega)$ |
| Option B: | $2/(1 - j\omega)$ |
| Option C: | $2 \cos \omega$ |
| Option D: | $2 \sin \omega$ |
| | |
| 16. | Duality Theorem / Property of Fourier Transform states that ….. |
| Option A: | Shape of signal in time domain & shape of spectrum can be interchangeable |
| Option B: | Shape of signal in frequency domain & shape of spectrum can be interchangeable |
| Option C: | Shape of signal in time domain & shape of spectrum can never be interchangeable |
| Option D: | Shape of signal in frequency domain & shape of spectrum can never be interchangeable |
| | |
| 17. | Which theorem states that the total average power of a periodic signal is equal to the sum of average powers of the individual Fourier coefficients? |
| Option A: | Parseval's Theorem |
| Option B: | Rayleigh's Theorem |
| Option C: | Thevenin's Theorem |
| Option D: | Norton's Theorem |
| | |
| 18. | Choose the correct expression for Fourier series coefficient Ck in terms of the discrete signal x(n). |

| | |
|---|---|
| Option A: | $\frac{1}{N}\sum_{n=0}^{N-1} x(n)e^{\frac{j2\pi nk}{N}}$ |
| Option B: | $\frac{1}{N}\sum_{n=0}^{N-1} x(n)e^{\frac{-j2\pi nk}{N}}$ |
| Option C: | $\frac{1}{N}\sum_{n=0}^{N+1} x(n)e^{\frac{j2\pi nk}{N}}$ |
| Option D: | $\frac{1}{N}\sum_{n=0}^{N+1} x(n)e^{\frac{-j2\pi nk}{N}}$ |
| | |
| 19. | The discrete time signal $a^n.u(n)$ will have alternate positive and negative amplitudes decaying with time for following case. |
| Option A: | -1<a<0; and n<0 |
| Option B: | -1<a<0; and n>0 |
| Option C: | 0<a<1; and n<0 |
| Option D: | 0<a<1; and n>0 |
| | |
| 20. | The Fourier transform of the signal sgn(t) is _____ |
| Option A: | −2jω |
| Option B: | 4jω |
| Option C: | 2/(jω) |
| Option D: | ( 1+ jω) |

| **Q2.** | **(20 Marks)** |
|---|---|
| **A** | **Solve any Two** **5 marks each** |
| i. | Determine the power and energy of the following continuous time signal $x(t)= e^{-at} u(t)$ |
| ii. | Check for the Dynamicity, Linearity, Shift Variant ,Causality and Stability $y(t) = x(2t)$ |
| iii. | Obtain the Fourier transforms and spectrums of the signal $x(t) = \cos w_o t$ |
| **B** | **Solve any One** **10 marks each** |
| i. | Find the inverse Laplace transform of the function $X(S) = \frac{3s+7}{(s^2-2S-3)}$ For ROCs of i) Re (s) > 3 ii) Re (s) < -1 iii) -1 < Re (s) < 3 |
| ii. | Perform the convolution of $x_1(t) = e^{-3t} u(t)$ and $x_2(t) = t\, u(t)$ Using |

| | |
|---|---|
| | mathematical method and also by graphical method. |

| **Q3.** | **(20 Marks)** |
|---|---|
| **A** | **Solve any Two** **5 marks each** |
| i. | Find the DTFT of discrete time signal $x(n) = a^n u(n)$ for $-1 < a < 1$. |
| ii. | Determine the z-transform of $x(n) = (1/2)^n u(n) + 2^n u(n)$. Find the ROC and draw the locations of poles and zeros in the z-plane. |
| iii. | Write the relationship between z-transform and discrete time fourier transform. |
| **B** | **Solve any One** **10 marks each** |
| i. | Find the inverse z- transform of<br>$X(Z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$<br><br>For ROCs of i) ROC: $\lvert(Z)\rvert > 1$<br>ii) ROC: $\lvert(Z)\rvert < 0.5$<br>iii) ROC: $0.5 < \lvert(Z)\rvert < 1$ |
| ii. | Determine DTFS for the sequence $x(n) = 4 \cos(\frac{\pi n}{2})$ |

# University of Mumbai
## Examination 2021 under Cluster 06
## (Lead College: Vidyavardhini's College of Engg Tech)

**Examination Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELX 604 and Course Name: Signals and Systems

Time: 2 hour Max. Marks: 80

==========

**Q1:**

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

**Important steps and final answer for the questions involving numerical example**

**Q2(A)(i)**

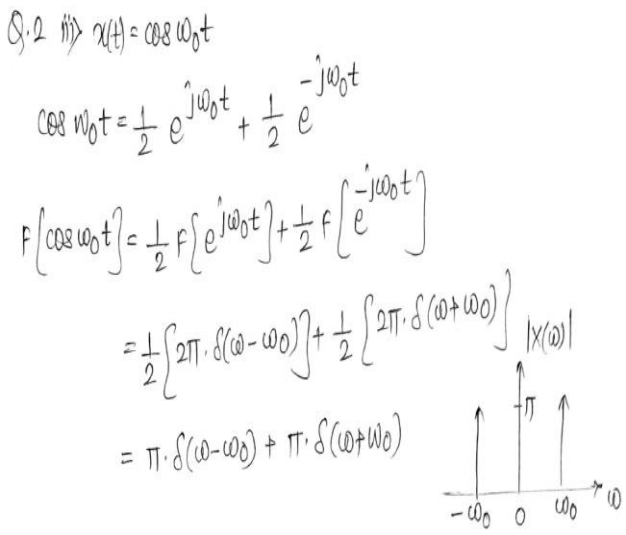
E = $\frac{1}{2a}$ Joule

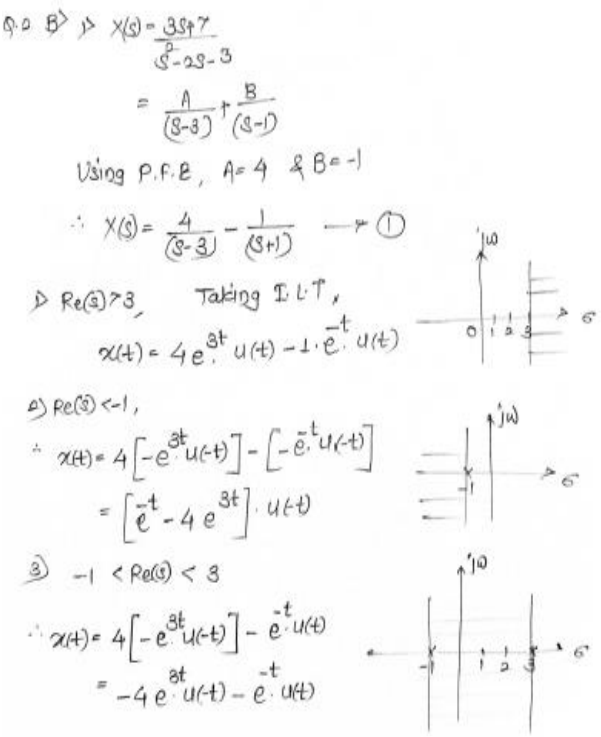
If Energy of the signal is finite then its power is zero.Given signal is an energy signal.

**(ii)**

System is a Dynamic, Linear, Shift Variant, Non-Causal and stable.

**(iii)**





Q.2 (B) (ii)

y (t) = x(t) * h(t)

Use the C.T convolution formula,

$y(t) = 1/9.( e^{-3t} + 3t - 1) , \quad t \geq 0.$

Graphical convolution method is necessary.

Q.3 (A) (i) DTFT of u(n) is $1/(1-ae^{-jw})$

(ii) $X(z)= \frac{z}{z-1/2} + \frac{z}{z-2}$

Draw pole-zero plot. ROC is $|z| > 2$

(iii) $X(e^{jw}) = X(z)|_{z=e^{jw}}$

Q.3(B) (i)

Q.3(B) (ii)

Fourier series coefficients:

$C_0= 0, C_1= 2, C_2= 0, C_3= 2,$

Fourier series representation of

$x(n) = 2e^{j\pi n/2} + 2 e^{j3\pi n2}$

# University of Mumbai
# Examination 2021 under Cluster 06
# (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELXDLO6021 and Course Name: Microwave Engineering

Time: 2 hours Max. Marks: 80

==========

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | Reflex klystron is |
| Option A: | An amplifier |
| Option B: | An oscillator |
| Option C: | An attenuator |
| Option D: | A filter |
| | |
| 2. | What is the best medium to handle the large microwave power |
| Option A: | Coaxial line |
| Option B: | Rectangular wave guide |
| Option C: | Strip line |
| Option D: | Circular wave guide |
| | |
| 3. | In a waveguide the guided wavelength is |
| Option A: | Same as the unguided wavelength |
| Option B: | Less than the unguided wavelength |
| Option C: | More than the unguided wavelength |
| Option D: | Not related to the unguided wavelength |
| | |
| 4. | Which is used for the amplification of microwave energy |
| Option A: | Gunn diode |
| Option B: | Reflex klystron |
| Option C: | Magnetron |
| Option D: | Travelling wave tube |
| | |
| 5. | On which of the following principle does Klystron operate? |
| Option A: | Amplitude Modulation |
| Option B: | Frequency Modulation |
| Option C: | Angle Modulation |
| Option D: | Velocity Modulation |
| | |
| 6. | Which of the following is the biggest advantage of the TRAPATT diode over IMPATT diode |

| | |
|---|---|
| Option A: | Low Noise |
| Option B: | High efficiency |
| Option C: | Ability to operate at high frequencies |
| Option D: | Lesser sensitivity to harmonics |
| | |
| 7. | In rectangular waveguides the ratio of width to height is |
| Option A: | 0.5 |
| Option B: | 1 |
| Option C: | 2 |
| Option D: | 4 |
| | |
| 8. | If a waveguide is filled with a dielectric having $\in_r = 4$, the phase velocity of the wave is |
| Option A: | $3 \times 10^8$ m/s |
| Option B: | $0.75 \times 10^8$ m/s |
| Option C: | $1.5 \times 10^8$ m/s |
| Option D: | $10^8$ m/s |
| | |
| 9. | Strip line can be compared to which of the following |
| Option A: | Flattened rectangular waveguide |
| Option B: | Flattened axial waveguide |
| Option C: | Flattened circular waveguide |
| Option D: | Flattened co axial cable |
| | |
| 10. | The IMPATT diode operates in --------- bias mode. |
| Option A: | forward |
| Option B: | zero |
| Option C: | Reverse |
| Option D: | saturation |
| | |
| 11. | In rectangular Waveguide, mode scripts m and n indicate |
| Option A: | Number of full wave patterns |
| Option B: | Number of half wave patterns |
| Option C: | Number of the zeros of the field |
| Option D: | No patterns in the field |
| | |
| 12. | In TE and TM modes of rectangular waveguides having propagation in *z* direction |
| Option A: | $E_z$ and $H_z$ are both zero |
| Option B: | In TE mode $E_z$ is zero and in TM mode $H_z$ is zero |
| Option C: | In TE mode $H_z$ is zero and in TM mode $E_z$ is zero |
| Option D: | In both TE and TM modes both $E_z$ and $H_z$ are non-zero |
| | |
| 13. | HEMT used in the microwave circuit is a |
| Option A: | Low noise Amplifier |
| Option B: | Detector |
| Option C: | Source |
| Option D: | High power Amplifier |
| | |

| | |
|---|---|
| 14. | If the length of the intrinsic region in IMPATT diode is 2 μm and the carrier drift velocity are $10^7$ cm/s, then the nominal frequency of the diode is |
| Option A: | 12 GHz |
| Option B: | 25 GHz |
| Option C: | 30 GHz |
| Option D: | 24 GHz |
| | |
| 15. | The fringe effect can be neglected in a parallel plate waveguide because of |
| Option A: | The dielectric material used |
| Option B: | The non-dielectric material used |
| Option C: | Width of the plates is greater than the distance between the plates |
| Option D: | Material of the parallel plate waveguide used |
| | |
| 16. | With an increase in the operating frequency of a micro strip line, the effective di electric constant of a micro strip line |
| Option A: | Increases |
| Option B: | Decreases |
| Option C: | Independent of frequency |
| Option D: | Depends on the material of the substrate used as the micro strip line |
| | |
| 17. | A magic tee is nothing but |
| Option A: | a modification of H - plane tee |
| Option B: | a modification of E - plane tee |
| Option C: | a combination of two E - plane tees |
| Option D: | a combination of E-plane and H-plane tee |
| | |
| 18. | GaAs is used in the fabrication of GUNN diodes because |
| Option A: | GaAs is cost effective |
| Option B: | It less temperature sensitive |
| Option C: | It has low conduction band electrons |
| Option D: | less forbidden energy gap |
| | |
| 19. | The TWT is sometimes preferred to the magnetron as a radar transmitter output tube because it is |
| Option A: | Less noisy |
| Option B: | More broad band |
| Option C: | Capable of a longer duty cycle |
| Option D: | A more efficient cycle |
| | |
| 20. | The mode of propagation in a micro strip line is |
| Option A: | Quasi TEM mode |
| Option B: | TEM mode |
| Option C: | TM mode |
| Option D: | TE mode |

| | | |
|---|---|---|
| **Q2.** | **Solve any Two Questions out of Three** | **10 marks each** |

| | |
|---|---|
| A | Describe the Gunn effect with the aid of two valley model theory. |
| B | Derive S matrix for a directional coupler and also verify properties of it. |
| C | A transmission system using a $TE_{10}$ mode waveguide of dimensions a=5cm, b=3cm is operating at 10GHz. The distance measured between two minimum power points is 1mm on a slotted line. Calculate the VSWR of the system |
| **Q3** | **Solve any Two Questions out of Three** **10 marks each** |
| A | Explain the construction of Magic Tee and Derive its S-matrix. |
| B | Explain the micro strip line matching networks and explain in detail noise figure in an amplifier |
| C | A two Cavity Klystron amplifier has the following parameters:<br>Vo=1000V, Ro=40 kOhm, Io=25mA, f=3GHz<br><br>Gap spacing in either cavity: d=1mm<br>Spacing between the two cavities: L=4cm<br>Effective shunt impedance, excluding beam loading: $R_{sh}$=30Kohm<br><br>A. Find the input gap voltage to give maximum Voltage V2.<br>B. Find the Voltage gain, neglecting the beam loading in the output cavity<br>C. Find the efficiency of the amplifier, neglecting beam loading.<br>D. Calculate justified in the preceding calculation the beam loading conductance and show that neglecting it was justified. |

# University of Mumbai
# Examination 2021 under Cluster 06
# (Lead College: Vidyavardhini's College of Engg Tech)

**Examination Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELXDLO6021 and Course Name: Microwave Engineering

Time: 2 hours Max. Marks: 80

==========

**Q1:**

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

**Important steps and final answer for the questions involving numerical example**

Q2(c):

For $TE_{10}$ mode waveguide,

$$\lambda_c = 2a = 2 \times 5 = 10cm$$

$$\lambda_0 = \frac{c}{f} = \frac{3 \times 10^{10}}{10 \times 10^9} = 3cm$$

$$d_2 - d_1 = 1mm = 10^{-1}cm$$

We know

$$\lambda_g = \frac{\lambda_0}{1 - (\lambda_0/\lambda_c)^2} = \frac{3}{\sqrt{1 - (3/10)^2}} = 3.144cm$$

For double minimum method VSWR is given by

$$VSWR = \frac{\lambda_g}{\pi(d_2 - d_1)} = \frac{3.144}{\pi(1 \times 10^{-1})} = 10.003 = 10$$

Hence, the VSWR value for the given transmission system is 10.

Q3(c):

**a.** For maximum $V_2$, $J_1(X)$ must be maximum. This means $J_1(X) = 0.582$ at $X = 1.841$. The electron velocity just leaving the cathode is

$$v_0 = (0.593 \times 10^6)\sqrt{V_0} = (0.593 \times 10^6)\sqrt{10^3} = 1.88 \times 10^7 \text{ m/s}$$

The gap transit angle is

$$\theta_g = \omega\frac{d}{v_0} = 2\pi(3 \times 10^9)\frac{10^{-3}}{1.88 \times 10^7} = 1 \text{ rad}$$

The beam-coupling coefficient is

$$\beta_i = \beta_0 = \frac{\sin(\theta_g/2)}{\theta_g/2} = \frac{\sin(1/2)}{1/2} = 0.952$$

The dc transit angle between the cavities is

$$\theta_0 = \omega T_0 = \omega\frac{L}{v_0} = 2\pi(3 \times 10^9)\frac{4 \times 10^{-2}}{1.88 \times 10^7} = 40 \text{ rad}$$

The maximum input voltage $V_1$ is then given by

The maximum input voltage $V_1$ is then given by

$$V_{1\max} = \frac{2V_0 X}{\beta_i \theta_0} = \frac{2(10^3)(1.841)}{(0.952)(40)} = 96.5 \text{ V}$$

**b.** The voltage gain is found as

$$A_v = \frac{\beta_0^2 \theta_0}{R_0} \frac{J_1(X)}{X} R_{sh} = \frac{(0.952)^2(40)(0.582)(30 \times 10^3)}{4 \times 10^4 \times 1.841} = 8.595$$

**c.** The efficiency can be found as follows:

$$I_2 = 2I_0 J_1(X) = 2 \times 25 \times 10^{-3} \times 0.582 = 29.1 \times 10^{-3} \text{ A}$$

$$V_2 = \beta_0 I_2 R_{sh} = (0.952)(29.1 \times 10^{-3})(30 \times 10^3) = 831 \text{ V}$$

Hence Efficiency= 46.2 %

# University of Mumbai
# Examination 2021 under Cluster 06
# (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELXDLO6022 and Course Name: Electronic Product Design

Time: 2 hour Max. Marks: 80

==========

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | What is the operating temperature range of military electronics products? |
| Option A: | 70°C to 100°C |
| Option B: | -25°C to 85°C |
| Option C: | -55°C to 125°C |
| Option D: | -75°C to 90°C |
| | |
| 2. | The Industry Product the cost is |
| Option A: | Very High |
| Option B: | High |
| Option C: | Low |
| Option D: | Moderate |
| | |
| 3. | Which type of noise coupling deals with the transmission or reception of propagating an electromagnetic energy in the circuit by yielding far-field effects? |
| Option A: | Conductive |
| Option B: | Inductive |
| Option C: | Radiated |
| Option D: | Capacitive |
| | |
| 4. | PLC is product which has been introduced in |
| Option A: | 4$^{th}$ Industrial Revolution |

| | |
|---|---|
| Option B: | 3rd Industrial Revolution |
| Option C: | 2nd Industrial Revolution |
| Option D: | 1st Industrial Revolution |
| | |
| 5. | What is the sampling rate of an analog real time oscilloscope (MSO)? |
| Option A: | 2 Gs/s |
| Option B: | 20 Gs/s |
| Option C: | 40 Gs/s |
| Option D: | 100 Gs/s |
| | |
| 6. | In μA741 op-amp, the use of 3 pF compensation capacitor also increases the slew rate by the factor of _____ |
| Option A: | 20 |
| Option B: | 15 |
| Option C: | 10 |
| Option D: | 30 |
| | |
| 7. | In the phases of product design the following phase needs less frequent iteration |
| Option A: | Design and Development |
| Option B: | Testing and verification |
| Option C: | Installation and Maintenance |
| Option D: | Modeling and simulation |
| | |
| 8. | Which among the below specified assertions is not a grounding consideration associated with ADC as well as DAC? |
| Option A: | Analog side to analog ground |
| Option B: | Digital side to digital ground |
| Option C: | Use of separate power supply and connection of their ground leads to single point reference |
| Option D: | Reduction of inductive loop area between power and return traces |
| | |
| 9. | The Following model takes a risk-oriented view of the development life cycle. |

| | |
|---|---|
| Option A: | Waterfall |
| Option B: | V Cycle |
| Option C: | Spiral |
| Option D: | Rapid Prototype |
| | |
| 10. | High current circuits are purposely located or placed near the edge of PCB in accordance to the supply lines for _____ |
| Option A: | Removal of heat |
| Option B: | Isolation of stray current |
| Option C: | Reduction of path length |
| Option D: | Remove the crosstalk |
| | |
| 11. | Which problems are about to occur if PCB is not designed properly in a confined manner for digital circuits?<br>A. Diffraction<br>B. Refraction<br>C. Ground & Supply-line Noise<br>D. Electromagnetic Interference |
| Option A: | A & B |
| Option B: | B & C |
| Option C: | C & D |
| Option D: | A, B, C, D |
| | |
| 12. | Which among the following exhibits inversely proportional relationship with the reliability? |
| Option A: | Production cost |
| Option B: | Design and development cost |
| Option C: | Maintenance and repair cost |
| Option D: | Quality Testing cost |
| | |
| 13. | Which among the following belongs to the category of logistic support type of requirement? |
| Option A: | Temperature condition |
| Option B: | Stress condition |

| | |
|---|---|
| Option C: | Duty Cycle |
| Option D: | Maintenance testing |
| | |
| 14. | Which process of product development cycle plays a crucial role in determining the suitability of requirements in accordance to the expected system solution along with the quantitative description? |
| Option A: | Validation |
| Option B: | Verification |
| Option C: | Integration |
| Option D: | Field Testing |
| | |
| 15. | What would be the composite failure rate of a system comprising one VLSI microprocessor with 6 SSI ICs and 10 resistors corresponding to the data given below?<br>Assume a single board system<br>PCB 2000 FIT<br>SSIC 70 FIT<br>R 20 FIT<br>VLSI microprocessor 600 FIT |
| Option A: | 1250 FIT |
| Option B: | 2400 FIT |
| Option C: | 3220 FIT |
| Option D: | 4520 FIT |
| | |
| 16. | Find the overall reliability of two systems connected in parallel having individual reliability 0.9 |
| Option A: | 0 .99 |
| Option B: | 1 |
| Option C: | 0 |
| Option D: | 0.9 |
| | |
| 17. | Static analysis of the designed product include: |
| Option A: | Cohesiveness |
| Option B: | Behavior verification |
| Option C: | Performance analysis |

| | |
|---|---|
| Option D: | Tradeoff analysis |
| | |
| 18. | What doesn't play a key role in the standard PCB documentation? |
| Option A: | Part number abbreviations |
| Option B: | Package size |
| Option C: | Lead spacing |
| Option D: | Rating of the components |
| | |
| 19. | What doesn't figure in the burden of legal liabilities gets reduced in the process of documentation? |
| Option A: | By failure modes |
| Option B: | By giving list of the components |
| Option C: | By warning of hazardous operations |
| Option D: | By operational limits |
| | |
| 20. | _____ is a systematic part list of the product and helps in evaluating an accurate cost and production efficiency. |
| Option A: | Manual |
| Option B: | Brochures |
| Option C: | Bill of material |
| Option D: | Memos |

| | |
|---|---|
| Q2 | **Solve any one Question out of Two** **10 marks each** |
| i | Classify the product based on six parameters |
| ii | Explain the main design considerations while designing Data Acquisition System. |
| B | **Solve any one Question out of Two** **10 marks each** |
| i | Explain different technological and other specifications in Electronic Product Design |

| | |
|---|---|
| ii | Characterize the Analog to Digital converter. Explain what basic parameters while testing the same. |

| | |
|---|---|
| Q3. | **Solve any one Question out of Two** **10 marks each** |
| i | How the AOI test is carried out state the limitations and advantages of the same. |
| ii | Explain black box, White box and grey box testing |
| B | **Solve any one Question out of Two** **10 marks each** |
| i | How does the V Cycle model differ from the waterfall model? Explain the V Cycle model with all the steps with proper justification |
| ii | Define documentation and explain different types of documentation with their specific use and format. |

# University of Mumbai
## Examination 2021 under Cluster 06
## (Lead College: Vidyavardhini's College of Engg Tech)

**Examination Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester VI

Course Code: ELXDLO6022 and Course Name: Electronic Product Design

Time: 2 hour Max. Marks: 80

==========

**Q1:**

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

# University of Mumbai
## Examination 2021 under Cluster 06
## (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016 (CBCGS)

Examination: TE Semester VI

Course Code: **ELXDLO6023** and Course Name: **Wireless Communication**

Time: 2 hour Max. Marks: 80

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | What must be designed to separate the transmit & receive signal at mobile subscriber unit. |
| Option A: | Antenna |
| Option B: | Duplexer |
| Option C: | Transceiver |
| Option D: | Control Unit |
| | |
| 2. | Formulate the system capacity, if a mobile communication system has allocated number of 800 voice channels. If the service area is divided into 20 cells with a frequency reuse factor of 4. |
| Option A: | 800 |
| Option B: | 3200 |
| Option C: | 4000 |
| Option D: | 16000 |
| | |
| 3. | For a given frequency reuse ratio of 8 and the cell radius of 0.8 km, the distance between nearest cochannel cells is |
| Option A: | 6.4 km |
| Option B: | 0.8 km |
| Option C: | 0.1 km |
| Option D: | 8.8 km |
| | |
| 4. | To examine the measure of the ability of a mobile subscriber to access a cellular system during the busiest hour is------ |
| Option A: | circuit merit level |
| Option B: | mean opinion score |
| Option C: | grade of service |
| Option D: | service quality |
| | |
| 5. | Two main reasons that contribute to the rapid fluctuations of the signal amplitude in mobile communications are |
| Option A: | Multipath fading and Doppler effect |
| Option B: | Reflection and Refraction |
| Option C: | Diffraction and Scattering |

| | |
|---|---|
| Option D: | Blocking and Shadowing |
| | |
| 6. | In the development of base station transmitter operates at 900 MHz carrier frequency. For a mobile moving at a speed of 72 Km/h in a direction perpendicular to the direction of arrival of the transmitted signal, the received carrier frequency is |
| Option A: | 899.99994 MHz |
| Option B: | 900.00006 MHz |
| Option C: | 900.00003 MHz |
| Option D: | 900 MHz |
| | |
| 7. | When 2 mobile subscribers are located at distance of 100 meters & 1 km apart from cell site resp. then by what amount the received signal strength differs? (assuming other parameters are constant). |
| Option A: | 20 dB |
| Option B: | 40 dB |
| Option C: | 80 dB |
| Option D: | 100 dB |
| | |
| 8. | The guard time between the time slots in TDMA frame helps in minimizing the interference due to__along different radio paths in the wireless channel. |
| Option A: | propagation delays |
| Option B: | adjacent channel |
| Option C: | multipath fading |
| Option D: | timing inaccuracies |
| | |
| 9. | To synthesize the increment in bandwidth of message signa, the deciding factor is |
| Option A: | PN Sequence |
| Option B: | Gold sequence |
| Option C: | Spread spectrum |
| Option D: | Processing gain |
| | |
| 10. | X-OR addition of 2 m sequence PN generators is nothing but |
| Option A: | propagation delay generator |
| Option B: | spectrum modulation |
| Option C: | golden ration generator |
| Option D: | gold sequence generator |
| | |
| 11. | To organize high spectrum efficiency and constant amplitude in GSM, the modulation technique used is ------ |
| Option A: | FSK |
| Option B: | QPSK |
| Option C: | GMSK |
| Option D: | OFDM |
| | |

| | |
|---|---|
| 12. | To facilitate the identity of mobile phone device, the MSC uses the database as --- |
| Option A: | HLR |
| Option B: | VLR |
| Option C: | AuC |
| Option D: | EIR |
| | |
| 13. | Considering Coded data packets in GSM, compute the net data rate (data plus signaling) and the effective transmission rate of a 9,600 bps GSM data service. |
| Option A: | 9600 bps |
| Option B: | 22.8 kbps |
| Option C: | 33.854 kbps |
| Option D: | 13 kbps |
| | |
| 14. | If the trailing bits, stealing bits, guard bits, and training bits in a GSM frame are considered as overhead, and the rest of the bits as data, then what is the percentage overhead in a GSM frame? |
| Option A: | 57.14 % |
| Option B: | 70.166 % |
| Option C: | 91 % |
| Option D: | 27 % |
| | |
| 15. | To illustrate the user occupying (a single) time slot has to wait for time duration of between two successive transmissions |
| Option A: | 577 µs |
| Option B: | 4.615 ms |
| Option C: | 120 ms |
| Option D: | 6.12 s |
| | |
| 16. | While design, the effect of spread spectrum modulation is that the bandwidth of the spreaded signal _____. |
| Option A: | remains constant |
| Option B: | increases significantly |
| Option C: | increases marginally |
| Option D: | decreases |
| | |
| 17. | How much bandwidth is occupied in selection of each carrier of IS-95 standard |
| Option A: | 25 KHz |
| Option B: | 30 KHz |
| Option C: | 200 KHz |
| Option D: | 1250KHz |
| | |
| 18. | Cdma2000-1xRTT system supports a typical throughput of up to _____ per mobile user. |
| Option A: | 115kbps |
| Option B: | 144 kbps |
| Option C: | 384 kbps |

| | |
|---|---|
| Option D: | 2 mbps |
| | |
| 19. | In closed loop power control, the base station sends power control messages to the mobile user about once every |
| Option A: | 1 ms |
| Option B: | 10 ms |
| Option C: | 100 ms |
| Option D: | 1 s |
| | |
| 20. | The logical control channel specified on the reverse link in W-CDMA system is which channel? |
| Option A: | Sync |
| Option B: | Access |
| Option C: | Paging |
| Option D: | pilot |

| **Q2** | |
|---|---|
| A | **Solve any Two** **5 marks each** |
| i. | Distinguish between frequency division duplexing & time division duplexing |
| ii. | Describe various factors influencing small scale fading |
| iii. | Discuss in brief about TDMA frame structure & Efficiency of TDMA. |
| B | **Solve any One** **10 marks each** |
| i. | Explain GSM Network architecture with neat block diagram.<br>Compute the longest time over which a mobile station would have to wait in order to determine the frame number being transmitted by GSM cell-site. |
| ii. | Illustrate the function of GPRS architecture in brief.<br>**A** CDMA system has a bandwidth of 1.25 MHz and transmits baseband data at 9.6 kbps rate. If 40 number of users can simultaneously establish communication links, what is the bandwidth efficiency of the system? |

| **Q3** | |
|---|---|
| A | **Solve any Two** **5 marks each** |
| i. | Describe the concept of frequency reuse, define cluster. |
| ii. | Explain the types of small-scale fading. |
| iii. | Discuss about direct sequence spread spectrum transmitter & receiver with neat block diagram. |
| B | **Solve any One** **10 marks each** |
| i. | Explain hand off in GSM, Illustrate types of GSM hand off in GSM. If the trailing bits, stealing bits, guard bits, and training bits in a GSM frame are considered as overhead, and the rest of the bits as data, then what is the percentage overhead in a GSM frame? |
| ii. | Distinguish between W-CDMA and IS-95 CDMA.<br>Determine the maximum raw instantaneous data rate that can be provided to a single user in EDGE, assuming that a single time slot on a single GSM channel is available. |

# University of Mumbai
# Examination 2021 under Cluster 06
# (Lead College: Vidyavardhini's College of Engg Tech)

**Examinations Commencing from June 01, 2021**

Program: **Electronics Engineering**

Curriculum Scheme: Rev 2016 (CBCGS)

Examination: TE Semester VI

Course Code: **ELXDLO6023** and Course Name: **Wireless Communication**

Time: 2 hour Max. Marks: 80

**Q1:**

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

**Q2. A) i)**

| FDD | TDD |
|---|---|
| Simpler to implement | Implementation is complex |

| | |
|---|---|
| Simultaneous uplink & downlink transmission | Only uplink (UL) or downlink (DL) at any time |
| No need for synchronization hence simpler implementation | Need for synchronization within the whole network |
| Needs paired spectrum | No need for paired spectrum |
| UL/DL ratio is fixed | Number of UL/DL ratio is changeable |
| Definition- | Definition- |
| Applications- | Applications- |

**(* 1 mark each)**

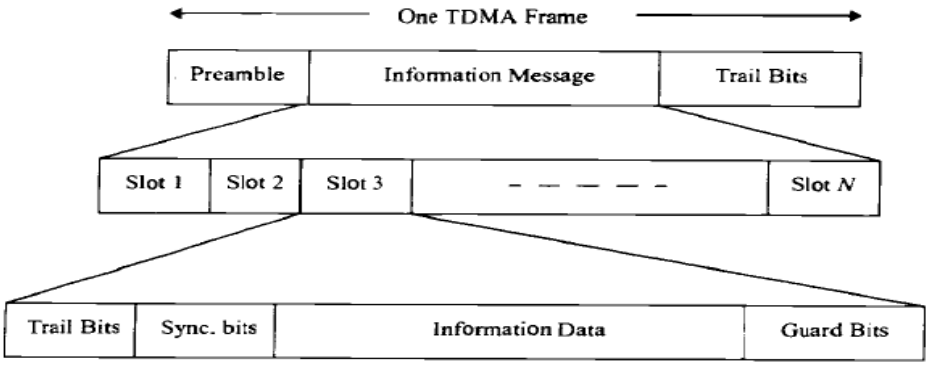
**ii)** Small Scale fading definition (reception of signal at rec. through multi directions..) **(1 mark)**

a) Multipath propagation, b) Speed of mobile, c) Speed of surrounding objects & d) The transmission bandwidth of signal (along with explanation) ….. **(1 mark each)**

**iii)** TDMA frame & explanation **– 3 marks**

Efficiency **– 2 marks**

**TDMA Frame –**




***Efficiency of TDMA*** — The efficiency of a TDMA system is a measure of the percentage of transmitted data that contains information as opposed to providing overhead for the access scheme. The frame efficiency, $\eta_f$, is the percentage of bits per frame which contain transmitted data. Note that the transmitted data may include source and channel coding bits, so the raw end-user efficiency of a system is generally less than $\eta_f$. The frame efficiency can be found as follows.

The number of overhead bits per frame is [Zie92],

$$b_{OH} = N_r b_r + N_t b_p + N_t b_g + N_r b_g \quad (8.2)$$

where, $N_r$ is the number of reference bursts per frame, $N_t$ is the number of traffic bursts per frame, $b_r$ is the number of overhead bits per reference burst, $b_p$ is the number of overhead bits per preamble in each slot, and $b_g$ is the number of equivalent bits in each guard time interval. The total number of bits per frame, $b_T$, is

$$b_T = T_f R \quad (8.3)$$

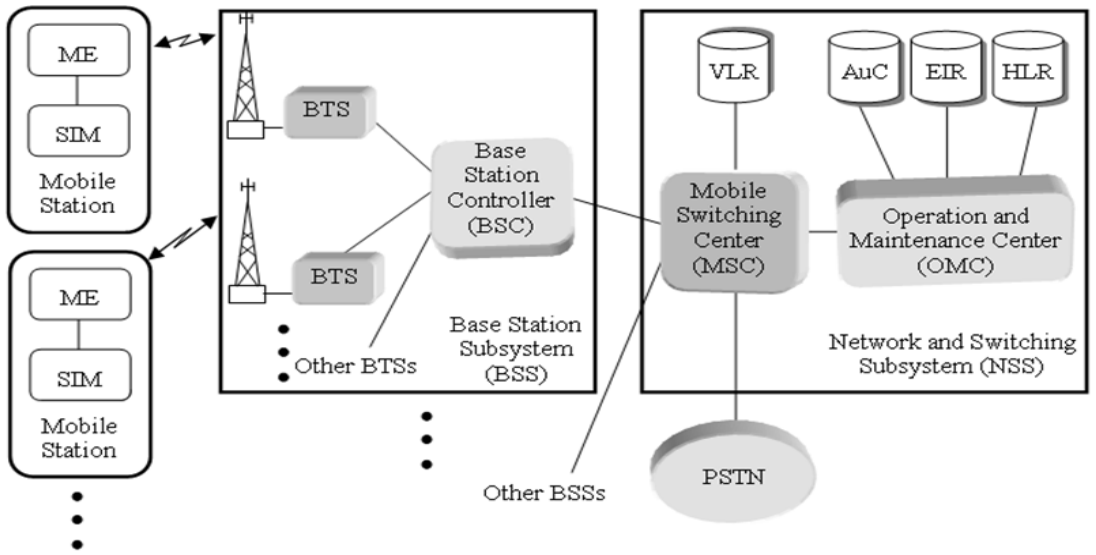
where $T_f$ is the frame duration, and $R$ is the channel bit rate. The frame efficiency $\eta_f$ is thus given as

$$\eta_f = \left(1 - \frac{b_{OH}}{b_T}\right) \times 100\% \quad (8.4)$$

**Q.2.B)**

**i)** Block diagram **– 3 marks**

Explanation – **4 marks**
Computation – **3 marks**




Explanation of each block----

**Computation:**

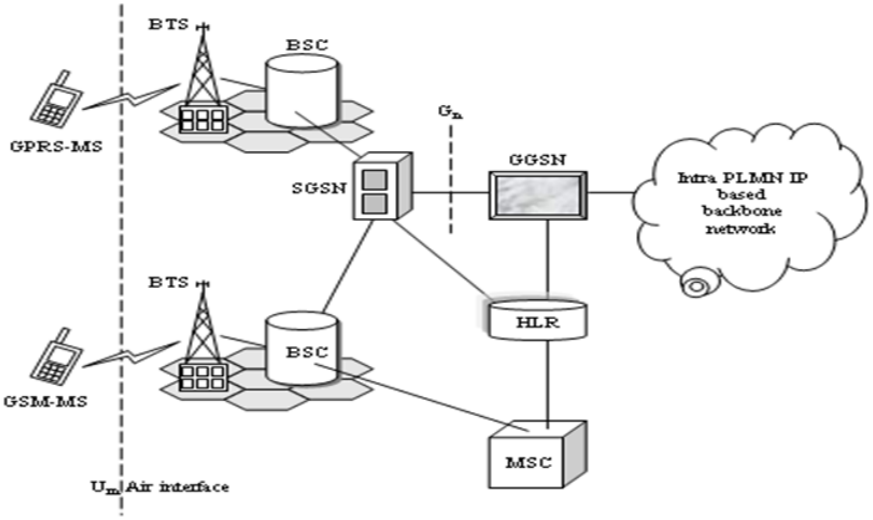
The counter for the multiframe keeps the track of traffic channel. So the longest time over which a mobile station would have to wait in order to determine the frame number being transmitted by a GSM cell-site will be same as the duration of a traffic multiframe.

| | | |
|---|---|---|
| Duration of a time-slot | = 0.577 ms | (Standard) |
| Number of time-slots per frame | = 8 | (Standard) |
| Therefore, duration of a frame | = 8 x 0.577 ms = 4.615 ms | |
| Number of traffic frames/multiframe | = 26 | |
| Therefore, duration of a multiframe | = 26 x 4.615 ms = 120 ms | |

Hence, longest time over which a MS would have to wait = **120 ms** **Ans.**

**ii)** Block diagram – **3 marks**
Explanation – **4 marks**
Computation – **3 marks**

**GPRS Architecture:**




**Example:**

| | | |
|---|---|---|
| CDMA system channel Bandwidth, | $B_c$ = 1.25 MHz or 1250 kHz | (Given) |
| Baseband data rate, $R_b$ | = 9.6 kbps | (Given) |
| Number of users, M | = 40 users | (Given) |
| Bandwidth efficiency | = (M x $R_b$) / $B_c$ = (40 x 9.6 kbps) / 1250 kHz | |
| | **= 0.307 bps/Hz** | **Ans.** |

**Q. 3. A)**

**i)** Frequency Reuse – **3 marks**

Cluster info. – **2 marks**

**Fundamentals of Frequency reuse :**

- Each cellular BS is allocated a group of radio channels to be used within a small geographic area called cell
- BS in adjacent cells are assigned channel groups which contain completely different channels than neighbouring cells
- By limiting the coverage area to within the boundaries of a cell, the same groups of channels may be used to cover different cells that are separated from one another by distances large enough to keep the interference levels within tolerable limits
- The design process of selecting and allocating channel groups for all of the cellular BSs is called frequency reuse or frequency planning

b. Reuse factor of 7

Frequency reuse concept

Consider cellular system with S duplex channels available,let each cell be allocated a group of k channels(k<s) and if the S channels are divided among N cells.

Available radio channels can be expressed as

$$S = KN$$

The N cells which collectively use the complete set of available frequencies is called a cluster.

If it is replicated M times within the system, total no.of duplex channels:

C, can be used as a measure of capacity and is given by

$$C = MKN$$
$$= MS$$

N = Cluster size and typically equal to 4,7,12.

**ii)** Based on multipath time delay- **2.5 marks**

Based on doppler spread - **2.5 marks**

**Small-Scale Fading**
(Based on multipath time delay spread)

| **Flat Fading** | **Frequency Selective Fading** |
|---|---|
| 1. BW of signal < BW of channel | 1. BW of signal > BW of channel |
| 2. Delay spread < Symbol period | 2. Delay spread > Symbol period |

**Small-Scale Fading**
(Based on Doppler spread)

| **Fast Fading** | **Slow Fading** |
|---|---|
| 1. High Doppler spread | 1. Low Doppler spread |
| 2. Coherence time < Symbol period | 2. Coherence time > Symbol period |
| 3. Channel variations faster than base-band signal variations | 3. Channel variations slower than baseband signal variations |

**iii)** DSSS transmitter- diag. & Explanation – **2.5 marks**
DSSS receiver- diag. & Explanation – **2.5 marks**

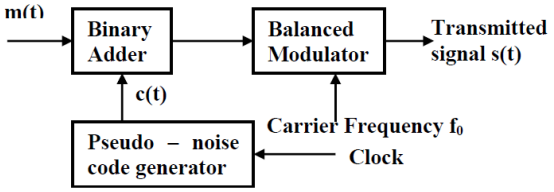



**Fig: 7.38.1 (a)** *Direct sequence spread spectrum transmitter*

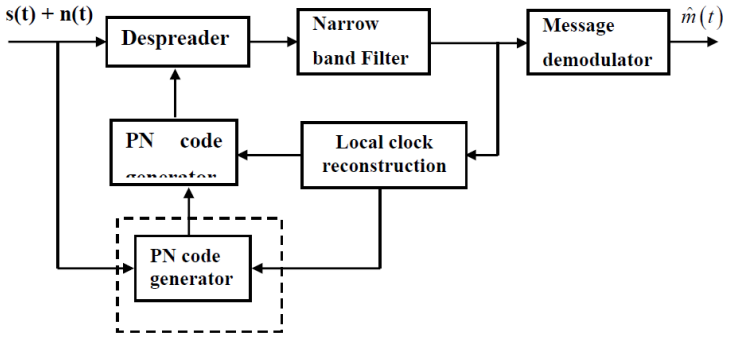



**Fig: 7.38.1 (b)** *Direct sequence spread spectrum receiver*

**Q.3. B)**

**i)** Definition of Hand off – **1 mark**

Types & explanation – **6 marks (1.5 each)**

Example – **3 marks**

- **Intracell-cum-intra-BTS handoff**
- **Intercell-cum-intra-BSC handoff**
- **Inter-BSC-cum-intra-MSC handoff**
- **Inter-MSC handoff**

| | | |
|---|---|---|
| Number of bits in a time-slot | = 156.25 bits | (Standard) |
| Number of time-slots per frame | = 8 | |
| Number of bits in a frame | = 156.25 x 8 = 1250 bits | |
| Number of trailing bits in a time-slot | = 3+3 = 6 bits | (Standard) |
| Number of stealing bits in a time-slot | = 1+1 = 2 bits | (Standard) |
| Number of guard bits in a time-slot | = 8.25 bits | (Standard) |
| Number of training bits in a time-slot | = 26 bits | (Standard) |
| Therefore, number of overhead bits per TS | = 6+2+8.25+26 = 42.25 bits | |
| Thus, number of overhead bits per frame | = 42.25 x 8 = 338 bits | |
| Percentage overhead per frame | = 338 / 1250 = 0.27 or **27%** **Ans.** | |

**Q. 3. B)**

**ii)** Distinguish – **6 marks**

Example – **4 marks**

## W-CDMA versus IS-95 CDMA

| **Technical Parameter** | **W-CDMA** | **IS-95** |
|---|---|---|
| Channel bandwidth | 5 MHz | 1.25 MHz |
| Chip rate | 3.84 Mcps | 1.2288 Mcps |
| Data rates | upto 2 Mbps | upto 9.6 kbps |
| Frame size | 10 ms | 20 ms |
| Spreading factor | upto 512 | 64 |
| Number of channels/terminal | variable | 1 |
| Downlink/uplink sharing | FDD/TDD | FDD |
| Downlink modulation | QPSK | QPSK |
| Uplink modulation | QPSK | OQPSK/Orthogonal |
| Downlink FEC | r = 1/2, 1/3 Convolutional or turbo | r = 1/2, L=9 Convolutional code |
| Uplink FEC | r = 1/2, 1/3 Convolutional or turbo | r = 1/3, L=9 Convolutional code |
| Voice encoding | Adaptive multirate ACELP (4.75 kbps to 12.2 kbps) | CELP at 9.6 kbps and 14.4 kbps |
| Traffic channels/RF channel | depends upon data rate | upto 63 in theory |

**Example:**

Raw instantaneous data rate on a single time slot = 22.8 kbps (standard)

Type of modulation used in EDGE = 8-PSK (standard)

Number of signal elements per bit = 3 (As in 8-PSK)

**M**aximum raw instantaneous data rate = 3 x 22.8 kbps = **68.4 kbps Ans.**

**University of Mumbai**
**Examination 2021 under Cluster 06**
**(Lead College: Vidyavardhini's College of Engg Tech)**
**Examinations Commencing from June 01, 2021**
Program: **Electronics Engineering**
Curriculum Scheme: Rev 2016
Examination: TE Semester VI
Course Code: ELXDLO6024 and Course Name: Computer Organization and Architecture
Time: 2 hour Max. Marks: 80

==========

| **Q1.** | **Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** |
|---|---|
| | |
| 1. | Which of the following Special purpose register holds the address of next instructions to be executed? |
| Option A: | Program Counter |
| Option B: | Instruction Register |
| Option C: | MAR |
| Option D: | Base Register |
| | |
| 2. | Booth's Multiplier |
| Option A: | reduces the number of partial products |
| Option B: | increases the number of partial products |
| Option C: | multiplies the number of partial products |
| Option D: | divides the partial products |
| | |
| 3. | Bias value for single precision and double precision representation is …… & ……. |
| Option A: | 128, 1024 |
| Option B: | 127 , 1023 |
| Option C: | 256, 512 |
| Option D: | 32, 64 |
| | |
| 4. | A set of microinstructions for a single machine instruction is called …. |
| Option A: | Program |
| Option B: | Command |
| Option C: | Micro program |
| Option D: | Micro command |
| | |
| 5. | Full form of MFLOPS is |
| Option A: | Millions of Fixed Point Operations Per Second |
| Option B: | Millions of Floating Point Operations Per Second |
| Option C: | Millions of Floating Point Opcodes Per Second |
| Option D: | Millions of Flip/Flops Operations Per Second |
| | |
| 6. | A micro-programmed control unit |
| Option A: | faster than a hard-wired control unit |
| Option B: | facilitates easy implementation of new instructions |
| Option C: | useful when very small programs are to be run |
| Option D: | usually refers to the control unit of microprocessor. |
| | |

| | |
|---|---|
| 7. | How many 128 X 8 RAM chips are needed to provide a memory capacity of 2048 bytes? |
| Option A: | 8 |
| Option B: | 16 |
| Option C: | 2 |
| Option D: | 4 |
| | |
| 8. | Which of the following is not a write policy to avoid Cache Coherence? |
| Option A: | Write through |
| Option B: | Write within |
| Option C: | Write back |
| Option D: | Buffered write |
| | |
| 9. | Which algorithm chooses the page that has not been used for the longest period of time whenever the page required to be replaced? |
| Option A: | First in first out algorithm |
| Option B: | Additional reference bit algorithm |
| Option C: | Least recently used algorithm |
| Option D: | Counting based page replacement algorithm |
| | |
| 10. | What are the five main components of a computer system |
| Option A: | CPU,CD-ROM, Mouse, Keyboard, Sound Card |
| Option B: | Memory ,Video card, Monitor, Software, Hardware |
| Option C: | Modem, Keyboard, Word Processor , Printer, Screen |
| Option D: | CPU, Memory ,System bus ,Input, Output |
| | |
| 11. | Cache memory works on the principle of …….. |
| Option A: | Locality of Memory |
| Option B: | Locality of reference |
| Option C: | Locality of data |
| Option D: | Locality of reference and memory |
| | |
| 12. | Hidden bus arbitration is feature of ……. |
| Option A: | MOD BUS |
| Option B: | CAN BUS |
| Option C: | PCI BUS |
| Option D: | ISA BUS |
| | |
| 13. | SIMD stands for …… |
| Option A: | Single information Multiple Design |
| Option B: | Single Instruction Multiple Data |
| Option C: | Single Instructions Multiple Design |
| Option D: | Single Information Multiple document |
| | |
| 14. | Which of the following processor has a fixed length of instructions? |
| Option A: | CISC |
| Option B: | RISC |
| Option C: | EPIC |
| Option D: | Multi core |
| | |
| 15. | The concept of pipelining is most effective performance if the tasks being performed in different stages …. |
| Option A: | Require different amount of time |
| Option B: | Require about the same amount of time |

| | |
|---|---|
| Option C: | Require different amount of time with time difference between any two tasks being same |
| Option D: | Require different amount with time difference between any two tasks being different |
| | |
| 16. | The set of loosely connected computers are called as _____ |
| Option A: | LAN |
| Option B: | WAN |
| Option C: | Workstation |
| Option D: | Cluster |
| | |
| 17. | An instruction pipeline can be implemented by means of …… |
| Option A: | LIFO Buffer |
| Option B: | FIFO Buffer |
| Option C: | Stack |
| Option D: | Both LIFO Buffer and FIFO Buffer |
| | |
| 18. | The Unit of data Exchange between Cache and Main Memory is known as |
| Option A: | Cache size |
| Option B: | Block size |
| Option C: | Page size |
| Option D: | Segment size |
| | |
| 19. | Hazards due to resource conflict are called as … |
| Option A: | Data Hazard |
| Option B: | Control Hazard |
| Option C: | Structural Hazard |
| Option D: | Both Data Hazard and Control Hazard |
| | |
| 20. | The following sequence of virtual page numbers is encountered in the course of execution on a computer with virtual memory:3 4 2 6 4 7 1 3 2 6 3 5 1 2 3 Assume that a least recently used page replacement policy. Find out the Page Hit Ratio with main memory with Page capacity n = 4. Assume that main memory is initially empty. |
| Option A: | 0.22 |
| Option B: | 0.10 |
| Option C: | 0.20 |
| Option D: | 0.16 |

| **Q2 (20 Marks)** | |
|---|---|
| A | **Solve any Two 5 marks each** |
| i. | Draw and explain instruction state diagram(without interrupt). |
| ii. | Explain different write policy methods. |
| iii. | Explain SRAM structure and working. |
| B | **Solve any One** **10 marks each** |
| i. | Discuss system buses in detail. Highlight PCI bus and its operation in detail. |
| ii. | Discuss Hardwired and Micro-programmed Control unit in detail. |
| **Q3 (20 Marks)** | |
| A | **Solve any Two out of three** **5 marks each** |
| i. | Write short notes on GPU. |
| ii. | Discuss paging concept in short. |
| iii. | Discuss I/O handling techniques. (any two techniques) |

| B | **Solve any One out of two** **10 marks each** |
|---|---|
| i. | Discuss parallel processing and pipelining in detail. |
| ii. | Explain Flynn's classification in detail with suitable diagrams. |

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Q1:

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