



COMSATS UNIVERSITY ISLAMABAD

Lahore Campus: Defence Road, Off Raiwind Road, Lahore

UAN: +92-42-111-001-007

Department of Electrical and Computer Engineering

Midterm Exam – Semester Fall 2021

Course Title:	Electric circuit Analysis-II	Course Code:	EEE222	Credit Hours:	4(3,1)
Course Instructor:	Dr. Tariq, Dr. Jawad, Dr. Khurram, Ayesha Ali, Amna Arif	Program Name:	BCE, BEE		
Semester and Batch:	3 rd		Date:	18-11-2021	
Time Allowed:	90 Minutes		Maximum Marks:	25	
Student's Name:	[REDACTED]		Reg. No.	[REDACTED]	
<ul style="list-style-type: none">• Read the question paper carefully. All parts are compulsory.• Exchange of calculators or any other thing is strictly not allowed.• This is closed book/closed notes exam. No cheat sheet or formula tables are allowed.• Clearly write each step in all questions. Clearly draw diagrams where needed/asked. Marks will not be awarded for incomplete step.					

Question 1: [C3, CLO1, PLO1]

(3+7=10) Marks

Refer to Figure 1 given below: the following parts need to be solved:

- Convert the given time domain circuit into frequency domain.
- Solve the circuit using any appropriate circuit analysis method (*Justify your selection with a valid reason*) and compute the value of voltage V_o in the circuit. All necessary equations and steps are required to secure full marks.

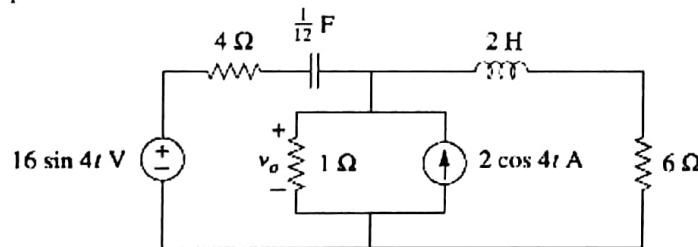


Figure 1

Question 2: [C3, CLO1, PLO1]

(2+2+1+1+2+2=10) Marks

Refer to Fig. 2 given below; the following parts need to be solved:

- Compute the values for I_1 , I_2 , I_3 , and I_S in phasor form (Amplitude and Phase)?
- Draw the Phasor diagrams for I_1 , I_2 , I_3 , and I_S with respect to the applied voltage V_s .
- From the phasor diagram that you will draw in part b, illustrate which variable is leading the other three?

- d. Identify the operating frequency of the circuit?
e. Compute the power factor (p.f.) of the circuit by constructing power triangle.
f. If it is desired to improve the power factor to 0.95 by installing capacitor in parallel with the circuit, then identify the value of that capacitor.

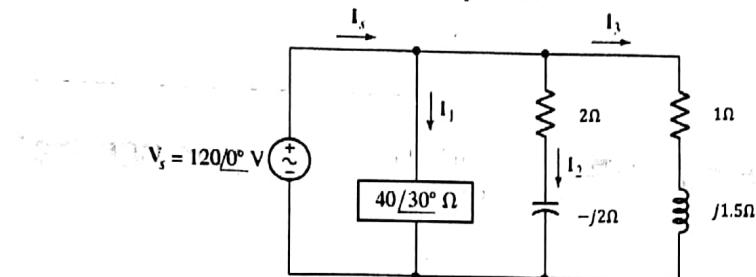


Fig. 2

Question 3: [C3, CLO1, PLO1] (1+2+2) Marks

A balanced abc-sequence Y-connected source in Figure 3 is connected to a Δ -connected balanced load $(2 + j4)$ Ω per phase.

- a. Identify whether the given three phase source is positive sequence or negative sequence, justify your answer.
b. Compute the phase currents for the balanced circuit.
c. Compute the line currents for the balanced circuit.

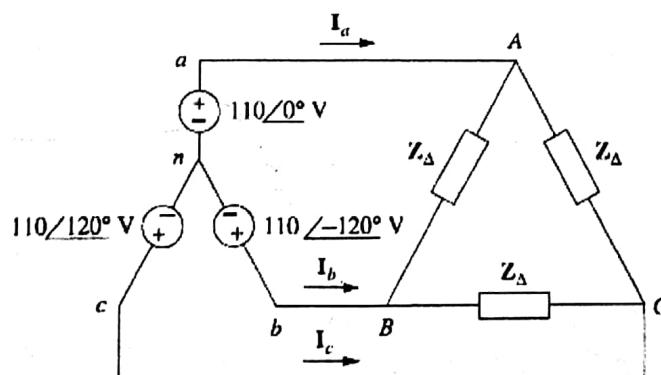


Figure 3



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Lahore Campus: Defence Road, Off Railwind Road, Lahore

UAN: +92-42-111-001-007

Department of Electrical and Computer Engineering

Mid Term – Fall 2021

Course Title:	Electronics I	Course Code:	EEE-231	Credit Hours:	4(3,1)
Course Instructor:	Dr. Nadeem Rafiq, Ms. Amna Arif, Mr. Ali Raza		Program Name:	FA20 BEE	
Semester and Batch:	3 rd		Date:	19 th November, 2021	
Time Allowed:	90 Minutes		Maximum Marks:	50	
Student's Name:	XXXXXXXXXX		Reg. No.	XXXXXXXXXX	

Note:

- Read the question paper carefully. All parts are compulsory.
- Exchange of calculators or any other thing is strictly not allowed.
- This is closed book/closed notes exam. No cheat sheet or formula tables are allowed.
- Clearly write each step in all questions. Clearly draw diagrams where needed/asked. Marks will not be awarded for incomplete step.

Section I

Question 1: (10 Marks)

Design a circuit to perform the function indicated in Figure 1.

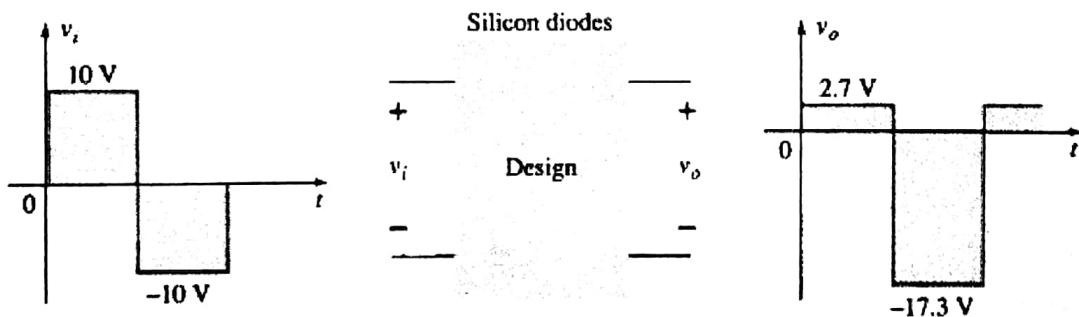
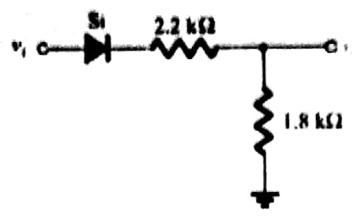
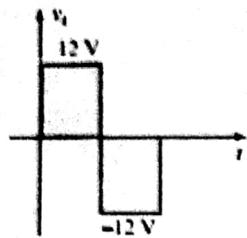


Figure 1

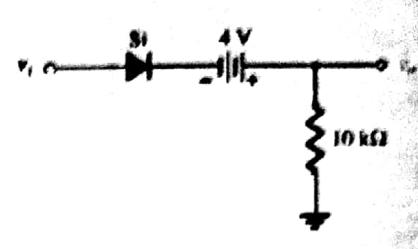
Question 2:

(5+5= 10 Marks)

Analyze the circuit of Figure 2 and determine V_O .



(a)



(b)

Figure 2

Section II

Question 3:

(15 Marks)

Design the emitter bias network at $I_{CQ} = 1/2I_{CSat}$ and $V_{CE} = 1/2V_{CC}$. Use $V_{CC} = 20\text{ V}$, $I_{CSat} = 10\text{ mA}$, $\beta = 120$ and $R_C = 4R_E$. Use standard values.

Question 4:

(15 Marks)

Analyze the circuit of Figure 4 and determine the range of possible values for V_C using $1\text{ M}\Omega$ potentiometer

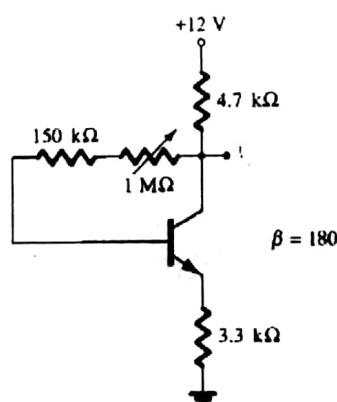


Figure 4



COMSATS University Islamabad, Lahore Campus

Department of Electrical & Computer Engineering

Mid Term Exam, Fall 2021

Course Title:	Introduction to Power Engineering		Course Code:	EEE281	Credit Hours:	3(3,0)
Course Instructor/s:	Ms. Nisma Saleem, Ms Sara Sajid		Programme Name:	BSEE		
Semester:	FA21		Batch:	FA19	Section:	P, E, T
Time Allowed:	90 minutes		Maximum Marks:	50		
Student's Name:	[REDACTED]		Reg. No.	[REDACTED]		

Important Instructions / Guidelines:

- All questions are compulsory.
- Exchange of calculators is strictly not allowed.

PART A

Question 1: (PLO1, CLO2, C3)

(10+10 = 20 Marks)

- I.** A 65,000 kW steam power station uses coal of calorific value 15,000 kcal per kg. If the coal consumption per kWh is 0.5 kg and the load factor of the station is 40%, *compute*:

- (i) The overall efficiency (5)
(ii) Coal consumption per day (5)

- II.** Sitara Energy Ltd. has in-house diesel power plant with the 40% plant capacity factor. The company installed two generating units having the capacity of 800 KW and 600 kW respectively. The alternators efficiency is 96% of both units. The fuel consumption of the plant is 0.30kg/kWh and the calorific value of fuel oil is 10500kcal/kg, *compute*:

- (i) The fuel oil is required for a month of 30 days (5)
(ii) Overall efficiency (3)
(iii) Engine efficiency (2)

PART B

Question 2: (PLO1, CLO1, C2)

(3+3+3+6+9+6 = 30 Marks)

A part of the three-phase power transmission system is shown in Figure 1.

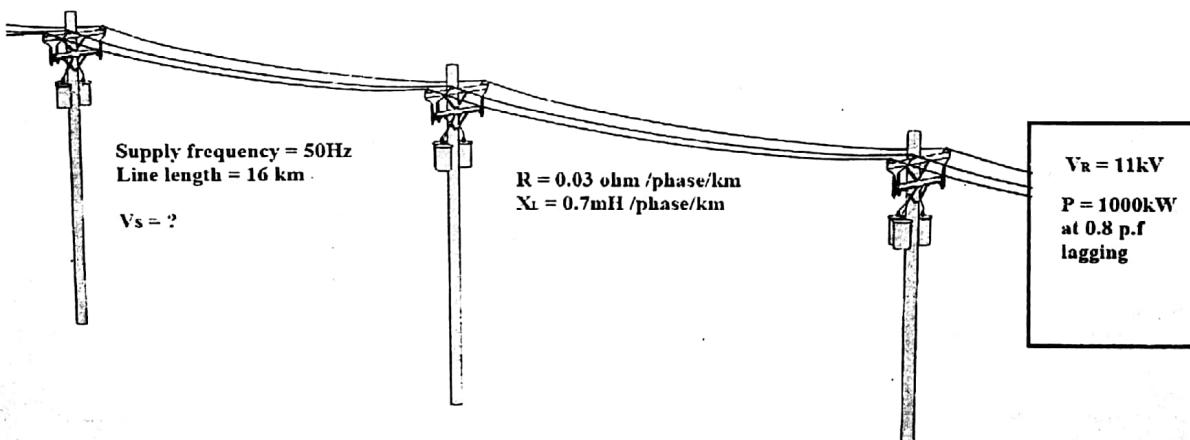


Figure-1

- i. *Select* the most appropriate type of conductor that should be used for the given transmission voltage.
- ii. *Identify* the type of insulator that is most economical and feasible for the given transmission line.
- iii. *Select* a suitable type of line support to provide better mechanical strength to the transmission system.
- iv. *Convert* the given schematic representation of transmission line into a per-phase equivalent circuit. Also *reproduce* its generalized phasor diagram for the given load.
- v. *Estimate* the sending end voltage, voltage regulation and transmission efficiency for the given system.
- vi. *Estimate* the disruptive critical voltage for the given system if the conductor radius is 1 cm and the conductors are spaced symmetrically 3.5 m apart. Take dielectric strength of air to be 30kV/cm.

END OF PAPER!



COMSATS University Islamabad, Lahore Campus

Department of Electrical & Computer Engineering

TERMINAL FALL 2021

Course Title:	Introduction to Power Engineering			Course Code:	EEE281	Credit Hours:	3(3,0)
Course Instructor/S:	Ms.Nisma Saleem, Ms. Sara Sajid			Programme Name:	BSEE		
Semester:	FA21	Batch:	FA19	Section:	P, E, T	Date:	03-01-2022
Time Allowed:	180 minutes			Maximum Marks:	100		
Student's Name:			Reg. No.				

Important Instructions / Guidelines:

- All questions are compulsory.
- Exchange of Calculator is strictly not allowed.
- Attempt all the questions in the same sequence as provided in the question paper.

QUESTION 1: CLO1 (Power Generation)

(7+5+8 = 20 Marks)

Considering the availability of resources, which type of plant will be more suitable for each of the region given below. *Explain* the reasons to choose the type of power plant, *summarize* the steps to follow for the installation of that power plant along with the machinery required.

- The coastal areas of Sind and Baluchistan (away from local population), having rich amount of radioactive elements, considering the availability of water resources which type of plant will be more suitable resulting minimum running cost, minimum space required for installation and maximum power generation capacity.
- The Thal desert of Punjab, Pakistan.
- The Gilgit Baltistan region which is famous for its highest mountains, beautiful landscape and wild rivers.

QUESTION 2: CLO2 (Power Transmission)

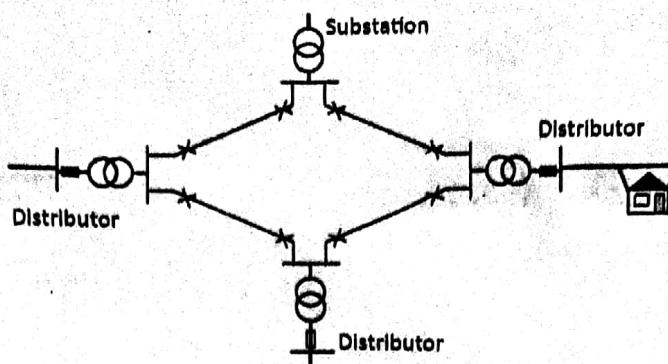
(5+15=20 Marks)

- An overhead transmission line has a span of 220m, the conductor weighting 804kg/km. *Compute* the maximum sag if the ultimate tensile strength of the conductor is 5758 kg. Assume a safety factor of 2.
- A single-phase transmission line 100 km long has the following constants: resistance per km is 0.4Ω , reactance per km is 0.6Ω , susceptance per km is 14×10^{-6} and receiving-end voltage is 33 kV. Assuming that the total capacitance of line is localized at the receiving-end, *Compute* (i) sending-end current, (ii) sending-end voltage, (iii) regulation, (iv) efficiency, and (v) supply power factor if the line is delivering 5 MW at p.f. 0.8 lagging.

QUESTION 3: CLO2 (Power Distribution)

(3+3+9 = 15 Marks)

A simple distribution system is mentioned in figure 1.

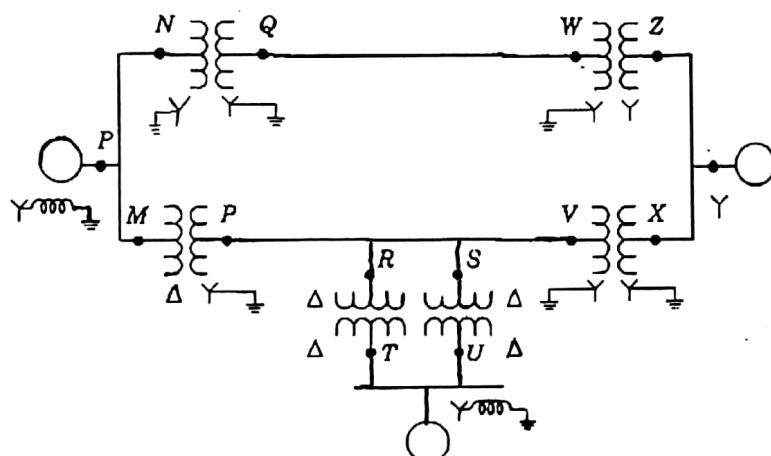
*Figure 1*

- Identify the connection scheme of the given distribution system and state any two advantages of this type of connection.*
- Suggest the method of cooling for the four distribution transformers connected in the given distribution system.*
- A 3-phase, synchronous motor at the end of one distributor in the given figure having a power consumption of 50 kW with a power factor of 0.8 lag. A bank of capacitors is connected in delta across the supply terminals and p.f raised to 0.9. Compute the value of leading reactive kVA supplied by the motor and the rating of capacitors connected in each phase.*

QUESTION 4: CLO2 (Power System Analysis)

(10+10 = 20 marks)

The one line diagram of a simple distribution system is shown in figure 2.

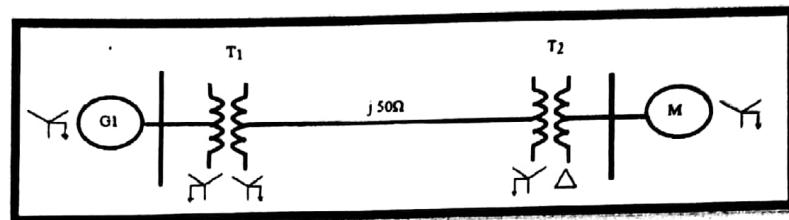
*Figure 2*

- a) Reproduce the positive, negative and zero sequence networks for the given power system.
- b) A line-ground fault occurs on section Q-W in such a way that produces a set of unbalanced voltages $V_a = 300 < -120^\circ$, $V_b = 200 < 90^\circ$, and $V_c = 100 < -30^\circ$. Compute the symmetrical components V_0 , V_1 and V_2 for the given sets of unbalanced phase voltages.

QUESTION 5: CLO1 (Power System Protection)

(5+20 = 25 marks)

- a) A circuit breaker is rated as 1000A, 1500MVA, 33kV, 3-phase oil circuit breaker, Identify (i) rated normal current, (ii) Breaking capacity (iii) rated symmetrical breaking current (iv) rated making current (v) short-time rating.
- b) The one-line diagram of a 100MVA, 220KV three-phase power system is shown in Figure 3. An earth fault occurs on the transmission line in such a way that the voltages of any two phases become equal and current of the third phase becomes zero.



→

Figure 3

Modify the complete power system by including feasible *protection equipment* (considering the rating of power system) to avoid severe damage against earth faults. *Explain* your modification for the following sections:

- i. Generator protection
- ii. Transformer protection
- iii. Line protection
- iv. Bus bar protection

BEST OF LUCK!



COMSATS University Islamabad, Lahore Campus
Department of Electrical and Computer Engineering

■ Terminal Examination – FALL 2021

Course Title:	Microprocessor System and Interfacing		Course Code:	EEE 342	Credit Hours:	4(3,1)
Course Instructor:	Dr. Naeem Shahzad, Mr. Nesruminallah, Mayyda Mukhtar		Programme Name:	Electrical Engineering		
Semester:	FA19	Branch:	BSEE	Section:	P, E & T	Date:
Time Allowed:	180 Minutes		Maximum Marks:	100		
Student's Name:			Reg. No.:			

Important Instructions / Guidelines:

- This is a closed book examination.
- Use of mobile is strictly forbidden during the examination.
- Attempt all the questions; there is NO choice in the questions.
- All answers must be given on the answer books.

Question 1:

[CLO2-C5-PLO3][20]

Integrate 128KB EEPROM with 8088 microprocessor using Line-decoder address decoding technique. Whereas, your memory integration must use the memory chips of 32KB and 16KB. Starting address of EEPROM is 80000H. You are required to provide the completely labelled schematic diagram and starting-ending addresses for each memory chip.

Question 2:

[CLO2-C5-PLO3][10]

Write an assembly language code to generate the repeating waveform at OUT1 as shown in Figure 1 using 8254 timer/counter. Whereas, timer/counter is interfaced with 8088 microprocessor at 0F0H having 0.5 MHz reference clock.

Note: Clearly mention the "Mode" and value of "N" required for the output waveform.

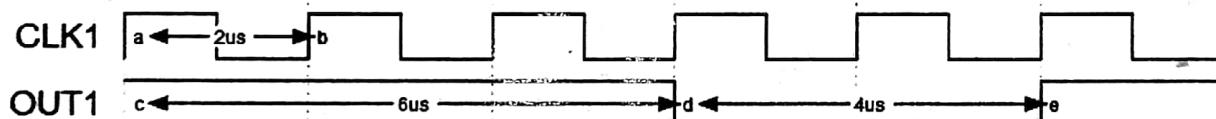


Figure 1: Timing Diagram of 8254 timer/counter

Hint:

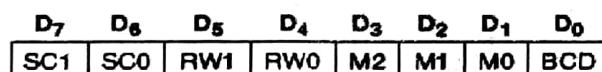


Figure 2: Control Word Register for Time/Counter

Question 3:

[CLO2-C5-PLO3][20]

Integrate 24KB SRAM with 8086 microprocessors using separate bank approach. Whereas, your memory integration must use the memory chips of 2KB. Starting address of SRAM is D8000H. You are required to provide the completely labelled schematic diagram and starting-ending addresses for each memory chip.

Question 4:**[CLO2-C5-PLO3][20]**

Integrate four toggle switches and a seven-segment display with 8088 microprocessor using Programmable Peripheral Interface (PPI) based on NAND address decoding techniques and assembly language programming as per the following instructions:

- Switches are to be interfaced with PPI using Port B.
- Seven Segment is to be interfaced with PPI using port A.
- The seven-segment display should display the input provided using toggle switches.

You are required to provide:

- An assembly language code of the above stated instructions.
- Completely labelled schematic of microprocessor, PPI, switch and seven-segment.

Question 5:**[CLO3-C5-PLO3][30]**

A XYZ bank wants a security system for its cash vault that allows only specified persons to access its vault. The bank manager wants to design a password-based security system at the entrance of cash vault such that:

- The system asks to enter a password comprising a two digits Hexadecimal number.
- If the password is correct the system opens the gate attached.
- The system switches on the buzzer if the password is incorrect.

Now being a design engineer, you are required to design this system using 8088 microprocessor for the bank. You are also required to provide a labelled schematic diagram and an assembly language code as per the conditions:

- Interface a suitable peripheral with 8088 microprocessor using PPI for entering password.
- Interface a motor with 8088 microprocessor using PPI for operation of entrance gate.
- Interface a buzzer with 8088 microprocessor using PPI ringing the alarm.

Hint:

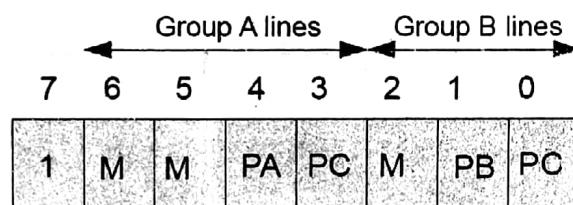


Figure 3: Control Word Register for PPI



COMSATS University Islamabad, Lahore Campus
Department of Electrical and Computer Engineering

TERMINAL – Fall 2021

Course Name	Data Communication and Computer Networks	Code No.	CPE314 EEE314	Credit Hours	4(3,1)
Student Name	A. Mudassir/M. Ashfaq/A. Faran	Roll No.		BSEE/BSCE	
Semester	FA21	FA19	T/A&B	SCHEME	
Date	10 th Jan, 2022				100
Name					

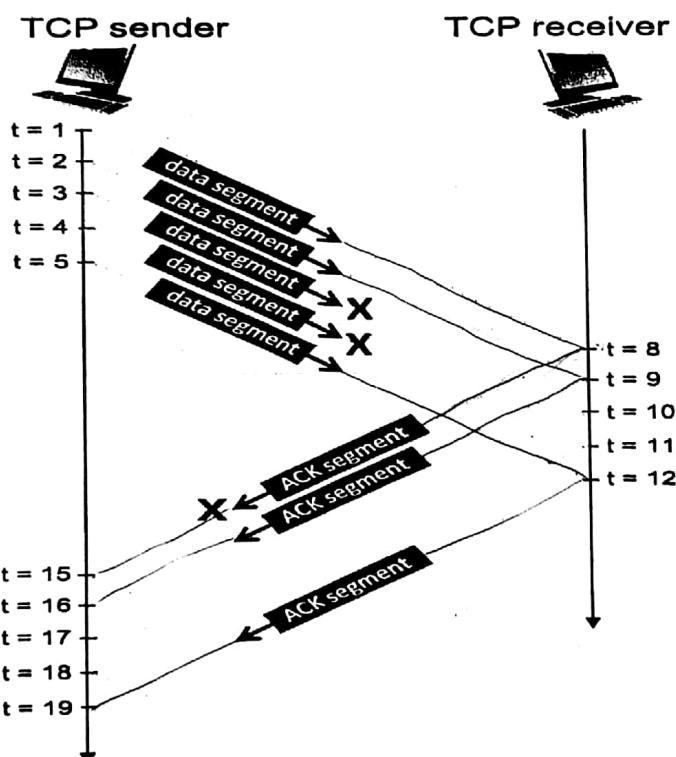
Important Instructions / Guidelines:

- In case of plagiarism, you will be marked ZERO.
- Show detailed calculations where required.
- Clearly show labelled diagrams where required.

Question 1:

CLO2-PLO4-C4 [20]

Consider the figure below in which a TCP sender and receiver communicate over a connection in which the segments can be lost. The TCP sender wants to send a total of 10 segments to the receiver and sends an initial window of 5 segments at $t = 1, 2, 3, 4$, and 5 , respectively. Suppose the initial value of the sequence number is 67 and every segment sent to the receiver each contains 190 bytes. The delay between the sender and receiver is 7 time units, and so the first segment arrives at the receiver at $t = 8$, and an ACK for this segment arrives at $t = 15$. As shown in the figure, 2 of the 5 segments is lost between the sender and the receiver, but one of the ACKs is lost. Assume there are no timeouts and any out-of-order segments received are thrown out.



Identify the following

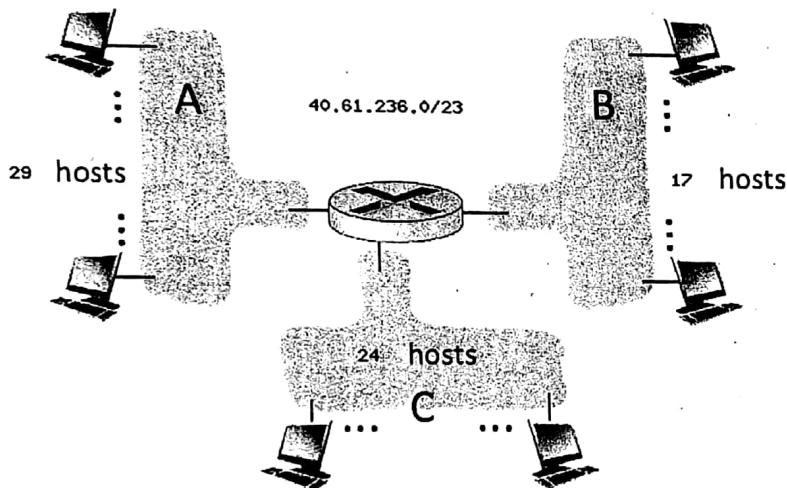
1. The sequence number of the segment sent at $t=1$?
2. The sequence number of the segment sent at $t=2$?
3. The sequence number of the segment sent at $t=3$?
4. The sequence number of the segment sent at $t=4$?
5. The sequence number of the segment sent at $t=5$?
6. The value of the ACK sent at $t=8$? (If segment lost, write 'x')
7. The value of the ACK sent at $t=9$? (If segment lost, write 'x')
8. The value of the ACK sent at $t=10$? (If segment lost, write 'x')
9. The value of the ACK sent at $t=11$? (If segment lost, write 'x')
10. The value of the ACK sent at $t=12$? (If segment lost, write 'x')

Question 2:

CLO3-PLO4-C4 [14]

Consider the router and the three attached subnets below (A, B, and C). The number of hosts is also shown below. The subnets share the 23 high-order bits of the address space: 40.61.236.0/23.

Assign subnet addresses to each of the subnets (A, B, and C) so that the amount of address space assigned is minimal, and at the same time leaving the largest possible contiguous address space available for assignment if a new subnet were to be added.



Identify the following

1. The address space is public or private.
2. Maximum number of hosts that can be there in this address space.
3. The subnet address of subnet A (CIDR notation).
4. The broadcast address of subnet A.
5. The starting address of subnet A.
6. The ending address of subnet A.
7. The subnet address of subnet B (CIDR notation).
8. The broadcast address of subnet B.
9. The starting address of subnet B.
10. The ending address of subnet B.

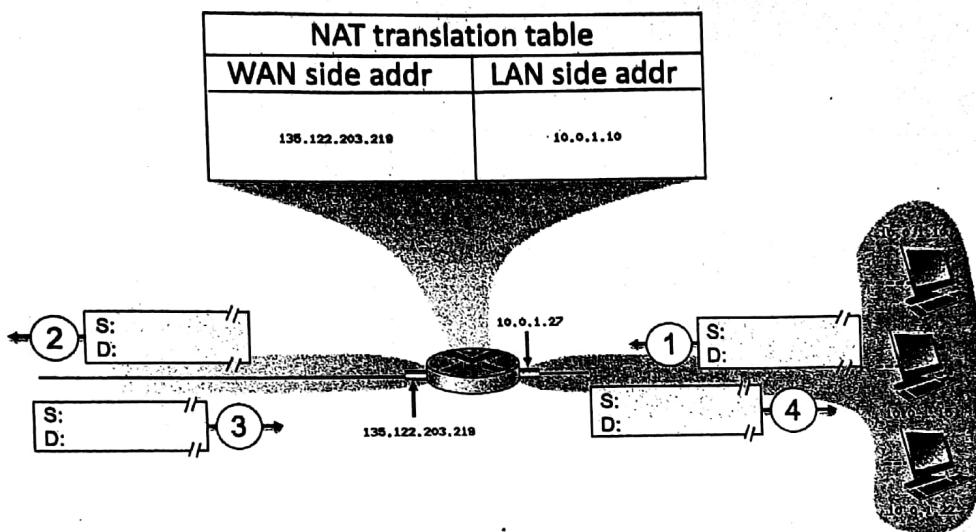
11. The subnet address of subnet C (CIDR notation).
12. The broadcast address of subnet C.
13. The starting address of subnet C.
14. The ending address of subnet C.

Question 3:

CLO3-PLO4-C4 [18]

Consider the scenario below in which three hosts, with private IP addresses 10.0.1.10, 10.0.1.15, 10.0.1.22 are in a local network behind a NAT'd router that sits between these three hosts and the larger Internet. IP datagrams being sent from, or destined to, these three hosts must pass through this NAT router. The router's interface on the LAN side has IP address 10.0.1.27, while the router's address on the Internet side has IP address 135.122.203.219

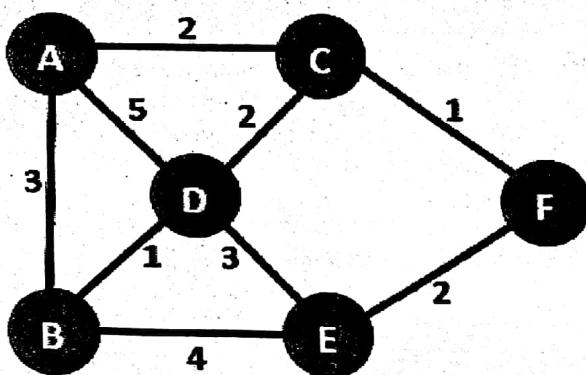
Suppose that the host with IP address 10.0.1.10 sends an IP datagram destined to host 128.119.173.188. The source port is 3404, and the destination port is 80.



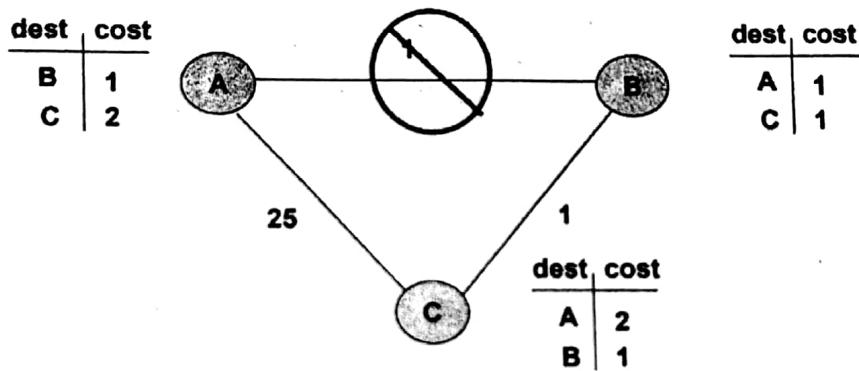
Identify the following

1. The source IP address for this datagram? Consider the datagram at step 1, after it has been sent by the host but before it has reached the router.
2. At step 1, the destination IP address?
3. The source IP address for this datagram? consider the datagram at step 2, after it has been transmitted by the router.
4. At step 2, the destination IP address for this datagram?
5. Will the source port have changed? Yes or No.
6. The source IP address for this datagram? Now consider the datagram at step 3, just before it is received by the router.
7. At step 3, the destination IP address for this datagram?
8. The source IP address for this datagram? consider the datagram at step 4, after it has been transmitted by the router but before it has been received by the host.
9. At step 4, the destination IP address for this datagram

- A. Consider the network shown below. Using Dijkstra's algorithm, identify the shortest path from node A to all other nodes. Show your work using a table.



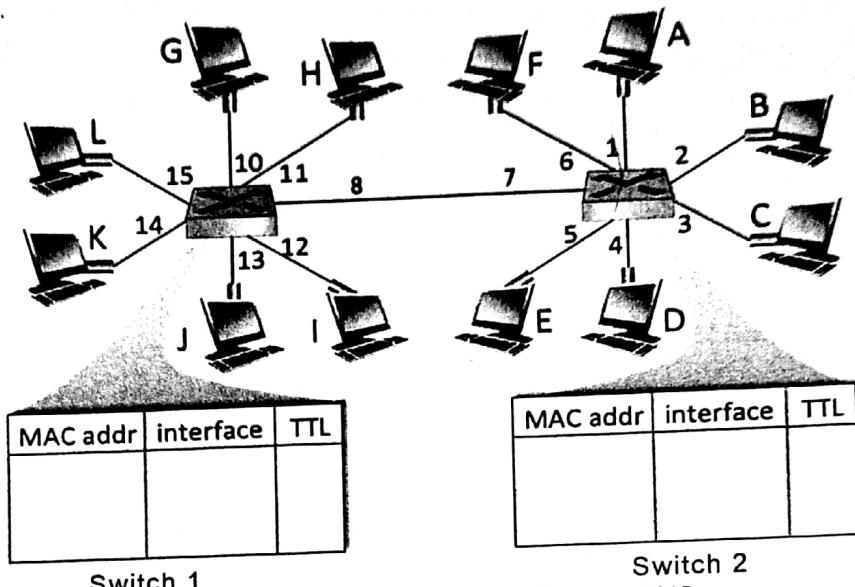
- B. A network comprising of 3 nodes is shown below. The network is running distance-vector routing protocol. The stable routing table at all nodes are shown next to each node. Suppose the link between node A and B goes down. Using multiple iterations, show clearly with help of network diagrams and routing tables the problem that arises under the new conditions.



- A. Forward error correction based on CRC has a 5-bit generator given by $G = 10011$. Compute the value of R when $D = 1010100000$.

- B. Consider the LAN below consisting of computers connected by two self-learning Ethernet switches. At $t=0$ the switch table entries for both switches are empty. At $t = 1, 2, 3$, and 4 , a source sends to a destination as shown below, and the destination replies immediately (well before the next time step). Assume that the following connections occur:

$t = 1: J \rightarrow E$
 $t = 2: K \rightarrow J$
 $t = 3: C \rightarrow H$



Identify the following. [format your answer as (letter, number) or N/A]

1. At $t=1$, the source entry for switch 1
2. At $t=1$, the destination entry for switch 1
3. At $t=1$, the source entry for switch 2
4. At $t=1$, the destination entry for switch 2
5. At $t=2$, the source entry for switch 1
6. At $t=2$, the destination entry for switch 1
7. At $t=2$, the source entry for switch 2
8. At $t=2$, the destination entry for switch 2
9. At $t=3$, the source entry for switch 1
10. At $t=3$, the destination entry for switch 1
11. At $t=3$, the source entry for switch 2
12. At $t=3$, the destination entry for switch 2



Terminal-Examination – Spring 2022

Course Title:	Electric Machines	Course Code:	EEE371	Credit Hours:	4(3,1)
Course Instructor:	Dr. Mujtaba Jaffery, Dr. Nadeem Rafiq, M. Talha Raheem	Program Name:	BSEE		
Semester:	6 th Batch FA19	Section:	E, P, T	Date:	
Time Allowed:	180 Minutes		Maximum Marks:		50
Student's Name:			Reg. No.:		

Important Instructions / Guidelines:

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Question 1:

[CLO1, C3]

[3+3+4=10 marks]

A 50-hp, 250-V, 1200 r/min dc shunt motor with compensating windings has an armature resistance (including the brushes, compensating windings, and interpoles) of 0.06Ω . Its field circuit has a total resistance $R_{adj} + R_F$ of 50Ω which produces a no-load speed of 1200 r/min. There are 1200 turns per pole on the shunt field winding (Figure 1).

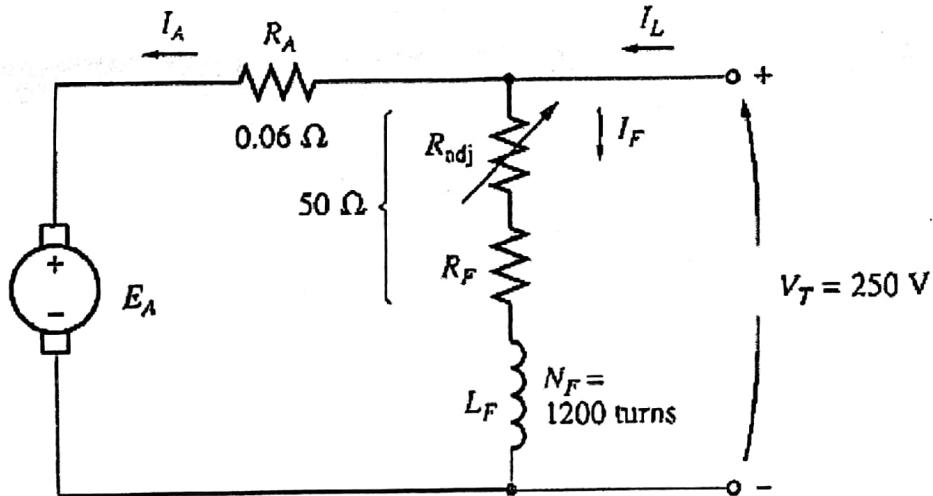


Figure 1

- Compute the speed of this motor when its input current is 200 A.
- Compute the speed of this motor when its input current is 300 A.
- Show the torque-speed characteristic of this motor.

Question 2:**[CLO1, C3]****[2+6+2+2+3=15 marks]**

A 480-V, 50-Hz, Y-connected, six-pole synchronous generator has a per-phase synchronous reactance of 1.0Ω . Its full-load armature current is 60 A at 0.8 PF lagging. This generator has friction and windage losses of 1.5 kW and core losses of 1.0 kW at 60 Hz at full load. Since the armature resistance is being ignored, assume that the I^2R losses are negligible. The field current has been adjusted so that the terminal voltage is 480 V at no load.

- Compute** the speed of rotation of this generator?
- Compute** the terminal voltage of this generator if the following are true?
 - It is loaded with the rated current at 0.8 PF lagging.
 - It is loaded with the rated current at 1.0 PF.
 - It is loaded with the rated current at 0.8 PF leading.
- Compute** the efficiency of this generator (ignoring the unknown electrical losses) when it is operating at the rated current and 0.8 PF lagging?
- Compute** the shaft torque must be applied by the prime mover at full load? How large is the induced counter torque?
- Compute** the voltage regulation of this generator at 0.8 PF lagging? At 1.0 PF? At 0.8 PF leading?

Question 3:**[CLO2, C4]****[4+2+4=10 marks]**

A 208-V, 40hp, 0.8-PF-leading, Δ -connected, 60-Hz synchronous machine has a synchronous reactance of 2.5Ω and a negligible armature resistance. Its friction and windage losses are 1.5 kW, and its core losses are 1.0 kW. Initially, the shaft is supplying a 15-hp load, and the motor's power factor is 0.80 leading

- Illustrate** the phasor diagram of this motor, and find the values of I_A, I_L, E_A .
- Assume that the shaft load is now increased to 30 hp. **Illustrate** the behavior of the phasor diagram in response to this change.
- Compute** I_A, I_L, E_A after the load change. What is the new motor power factor?

Question 4:**[CLO2, C4]****[3+2+2+1+2+2+2+1=15 marks]**

A 208-V, four-pole, 60-Hz, Y-connected wound-rotor induction motor is rated at 30 hp. Its equivalent circuit components are

$$R_1 = 0.100\Omega \quad R_2 = 0.070\Omega \quad X_M = 10\Omega$$

$$X_1 = 0.210\Omega \quad X_2 = 0.210\Omega$$

$$P_{mech} = 500W \quad P_{misc} = 0 \quad P_{core} = 400W$$

For a slip of 0.05, **Illustrate**

- a) The line current I_L
- b) The stator copper losses P_{SCL}
- c) The air-gap power P_{AG}
- d) The power converted from electrical to mechanical form P_{conv}
- e) The induced torque τ_{ind}
- f) The load torque τ_{load}
- g) The overall machine efficiency
- h) The motor speed in revolutions per minute and radians per second

COMSATS UNIVERSITY ISLAMABAD, LAHORE CAMPUS

Midterm Terminal Examination –SPRING 2022

Course Title:	Broadband Technologies	Course Code:	EEE456	Credit Hours:	3
Course Instructor/s:	Mian Ahmed Yaser	Program Name:	BEE-T		
Semester:	7/8	Batch:	FA18-BEE-T	Section:	A Date: 13-05-2022
Time Allowed:	90 minutes		Maximum Marks:		50
Student's Name:		Reg. No.			

Important Instructions / Guidelines:

- All questions are **Compulsory**. State all the assumptions and conditions clearly
- Use appropriate illustrations to support your answers where necessary

1.

(CLO1, 20 marks)

- If there is inelastic traffic in a core data communication network along with elastic traffic, **Illustrate** how would the inelastic traffic be treated. (5)
- Outline** the technologies that played a role in evolution of internetworking. (5)
- Compare** the propagation delay to the transmission delay experienced in sending a frame between 2 nodes 5,000Km apart, if the size of the frame is 1000 bytes and the medium is optical fiber supporting 2 Mbps. (5)
- Layer 3 in X.25 appends a header to the user data to form a packet. **Outline** the contents of this header and what are its functions? (5)

2.

(CLO1, 15 marks)

- Compare** the Frame Relay with X.25 technology. Elaborate the differences only. (5)
- Discuss** why does a User-Network Interface ATM cell format has Generic Flow control field, while, a Network-Network interface does not have it. (5)
- Compare** the functions of SAR PDUs of ATM with CS PDUs of ATM. (5)

3.

(CLO2-C4, 5 marks)

- A Discrete Multitone (DMT) Modem sends out test signals on each sub-channel of 4 kHz. It was observed that Signal to Noise Ratio on the initial 64 channels was on the average 10 dB, 2nd set of 64 channels was on the average at 11dB, 3rd set of 64 channels was on the average at 20 dBs

and the 4th set of 64 channels was on the average 29 dBs. Following is the mapping of data rates associated with these SNRs:

10 dB: 10 kbps

11 dB: 20 kbps

20 dB: 40 kbps

29 dB: 60kbps

Calculate the total download speed in bits per second that this connection can support.

Illustrate this technique in a diagram.

(5)

(Hint: Each of the 64 channels in a set carries the above-mentioned data speeds)

- ii) Calculate the time taken by one byte in the payload of an STS-12 (622 Mbps) frame of SONET.

(Hint: Number of columns in STS-12 is 12 times that of STS-1)

(5)

- iii) Illustrate using multiplexing structure diagram and associated framing diagram, how would an E1 be loaded on an STM-1 frame.



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Midterm ■ Terminal Examination □ – SPRING 2022

Course Title:	Digital Signal Processing (Theory)		Course Code:	EEE 324	Credit Hours:	3(3,1)
Course Instructor:	Mian Ahmed Yaser, M Usman Iqbal		Programme:	BEE-T, P		
Semester:	6 th	Batch:	FA19-BEE	Section:	Date:	10 May 2022
Time Allowed:	1.5 Hours		Maximum Marks:	50		
Student's Name:			Reg. No.	CUI/ /LHR		
Important Instructions / Guidelines:						
<ul style="list-style-type: none">Sharing of items is not allowed.This is a closed book and closed notes examination.The answers should be concise.If needed, use appropriate illustrations to support your answers.In numerical problems, provide all the calculations.Attempt all questions, there is no choice.						

Question 1 [C3-CLO1-PLO1]: (10 marks)

Consider an analogue signal

$$x_a(t) = 3 \cos 600 \pi t + 2 \cos 1800 \pi t$$

The link operates at 10,000 bits/sec and each input sample is quantized into 1024 different voltage levels.

- What is the sampling frequency and folding frequency?
- Calculate the Nyquist rate for the given signal $x_a(t)$.
- What are the frequencies in the resulting discrete -time signal $x(n)$.
- What is the resolution Δ .

Question 2 [C3-CLO1-PLO1]: (10+10=20 marks)

- a) Compute the convolution $y(n) = x(n) * h(n)$

If,

$$x(n) = \{0, 1, 4, -3\}$$

↑

$$h(n) = \{1, 0, -1, -1\}$$

↑

- b) Determine the impulse response of the system described by the following difference equation:

$$y(n) = 0.6 y(n-1) - 0.8 y(n-2) + x(n)$$

Determine the structure realization of the system using Direct form-I and Direct form-II

Question 3 [C3-CLO1-PLO1]:**(10+10=20 marks)**

- a) A system is required to produce an output of

$$y(n) = (1/3)^n u(n)$$

if the following excitation is applied: $x(n) = (1/2)^n u(n) - (1/4)(1/2)^{n-1} u(n-1)$

Determine the impulse response $h(n)$ and the system function $H(z)$ of the system.

- b) Determine the one-sided z-transform of the signal given below:

$$x(n) = \{2, 4, 5, 7, 0, 1\}$$



COMSATS University Islamabad, Lahore Campus
Department of Electrical and Computer Engineering

Midterm Terminal Examination –SPRING 2022

✓ Question 1:

[CLO1-C2] (4)

Give Examples of each of the following wireless network types:

- i. Multihop-Infrastructureless
 - ii. Multihop-Infrastructure ~~based~~
 - iii. Single hop-Infrastructure less
 - iv. Single hop-Infrastructure based

✓ Question 2:

[CLO1-C2] (6)

As compared to wired communication, wireless networks face certain impairments, like decreasing signal strength, interference from other sources and Multipath propagation. How do these characteristics affect bit error probability? Suggest three methods to improve the communication quality when wireless medium is used.

~~• Question 3~~

[CLO2-C4] (5)

A digital wireless transmission setup is communicating at 8 Mbps using QAM256 Modulation. A bit error rate of 10^{-7} was observed at 09:00am. Due to the advent of many users and placement of new equipment hindering the wireless paths, Signal to Noise ratio deteriorated and increased the BER to 1 in 10 at 10:00 am. How does a wireless network cater this situation? Illustrate with a curve/graph. Justify the new data rates mathematically.

✓Question 4:

[CLO2-C4] (5)

A [1,0] message is desired to be sent across a wireless communication channel. A CDMA system is employed, a code [11101000] was allotted to a legitimate user. A clandestine intruder tries to decode the message with the following two codes [11001000] and [11101001]. Confirm, that the clandestine user is not able to decode the message.

✓ Question 5

[CLO2-C4] (5)

Suppose an 802.11b/g/n station is configured to always reserve the channel with the RTS/CTS sequence. Suppose this station suddenly wants to transmit 2 MB of data and 2000 bytes can be sent in each frame as payload. Assume a transmission rate of 11 Mbps. Considering all delays and assuming Frame Error Rate of 50% or 0.5, identify the time required to transmit the data and receive the acknowledgement.

✓Question 6:

[CLO2-C4] (5)



Above diagram shows a scenario in which Host 1 and Host 2 are in the range of AP and AP is in the range of Host 1 and Host 2, but both the hosts are not in each other's range. Which technique is used to cater this problem? Illustrate with a diagram, explaining steps.

✓Question 7:

[CLO2-C4] (5)

A mobile Data service user with IP address 125.135.42.201 moves from its home network 125.135.42/24 to a foreign network 88.134.52/24. Compare the three methods that can be used by the networks to allow a correspondent to communicate with the User. Consider both way communication.

✓Question 8:

[CLO2-C4] (5)

- i. Which communication standard will be used to connect multiple users connecting them in master-slave orientation, while parking 255 more users?
- ii. Give the name/number of the standard.
- iii. Which multiple access technique is used in that standard?
- iv. What size of time slot it uses and how many channels are in it?
- v. Which network topology will it create? Resolving which physical issue, this technique is designed for?
- vi. It is required to connect multiple sensors placed in close proximity connected at 100Kbps, which communication technology would you suggest?

✓Question 9:

[CLO2-C4] (5)

1. Illustrate 3G system architecture
2. Explain how does a 3G user connect to a land-line phone and a server placed in Dubai (use the 3G system architecture diagram)

✓Question 10:

[CLO2-C4] (5)

- i. Describe the step-wise process of power Management in a WiFi setup.
- ii. Describe the processes of handoff between base-stations in GSM
- iii. What is the significance of Anchor MSC, if a mobile user moves from a base-station of one MSC to another MSC?



COMSATS University of Information Technology Lahore

Final Term Examination – SP 2022

Course Title:	Engineering Economics			Course Code:	ECO300	Credit Hours:	3(3.0)
Course	Fakhar Un Nisa				Program Name:	BEE	
Semester:	6 th , 7 th	Batch:	FALL-19	Section:	P, E, T	Date:	27-06-2022
Time Allowed:	3 Hour				Maximum Marks:		50
Student's Name:					Reg. No.		
Important Instructions / Guidelines:							

✓ Question no: 1)

[5+5+5=15 Marks]

- a) Define the term inventory. Also explain its main functions and two basic inventory decisions generally taken by managers? (CLO-1)
- b) Describe in detail the declining balance method of depreciation. (CLO-1)
- c) Describe the term unemployment? Also describe the main types of unemployment? (CLO-1)

✓ Question no: 2)

[5+5=10 Marks]

- a) An equipment costs Rs. 1,500,000. At the end of its economic life of five years, its salvage value is Rs. 500,000. Using Sum of the Years Digit Method of Depreciation.
 - I. Solve for the total depreciation up to the third year.
 - II. Solve for the book value in the third year? (CLO-2)
- b) A company has to replace a present facility after 15 years at an outlay of Rs. 500,000. It plans to deposit an equal amount at the end of every year for the next 15 years at an interest rate of 18% compounded annually. Find the equivalent amount that must be deposited at the end of every year for the next 15 years? (CLO-2)

✓ Question 3:

[15 Marks]

A machine costs Rs. 5,00,000. Its annual operation cost during the first year is Rs. 40,000 and it increases by Rs. 5,000 every year thereafter. The maintenance cost during the first year is Rs. 60,000 and it increases by Rs. 6,000 every year thereafter. The resale value of the machine is Rs. 4,00,000 at the end of the first year and it decreases by Rs. 50,000 every year thereafter. Assume an interest rate (discounting factor) of 20%. Find the economic life of the machine assuming zero inflation rate.

✓ Question 4:

[10 Marks]

- a) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in a stock for one year is Rs.2.00/= and the set up cost of a production run is Rs.1800/=. How frequently, should production run be made? (CLO-2)

Fakhar Un Nisa



COMSATS University Islamabad (CUI), Lahore Campus

Department of Electrical and Computer Engineering

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Terminal - Spring 2022

Course Title:	Digital Signal Processing			Course Code:	EEE324	Credit	4(3,1)
Course Instructor/s:	Dr. Khurram Ali, Dr. Saad Aslam, Mr. Ahmed Yaser				Programme Name:	BSEE, BSCE	
Semester:	6 th	Batch:	FA19	Section:	E, P, T	Date	June 28, 2022
Maximum Marks: 50							
Student's Name:				Reg. No.			

Important Instructions / Guidelines for Preparation/ Submission of Assignment:

- Fill in the Student's Name and Registration Number in the above table.
- Do not write on the question paper.
- Attempt all questions.
- This exam is accompanied by a Formula Sheet.
- Please show all steps to get full credit.

Q# 1 [CLO1PLO1]

[2+3+3 = 08 Marks]:

- A. Compute** the auto-correlation of the sequences given below. Write your answer in a form clearly indicating the term corresponding to lag zero:

$$(i) \quad x_1(n) = u(n) - u(n-4)$$

$$(ii) \quad x_2(n) = e^{j\pi} \{u(n-1000) - u(n-1004)\}$$

- B. Compute** the Z-Transform of the following system. Clearly state and draw the RoC as well.

$$(i) \quad x(n) = \begin{cases} \left(\frac{1}{3}\right)^n & n \geq 0 \\ \left(\frac{1}{2}\right)^{-n} & n \leq 0 \end{cases}$$

$$(ii) \quad x_2(n) = x(n+4)$$

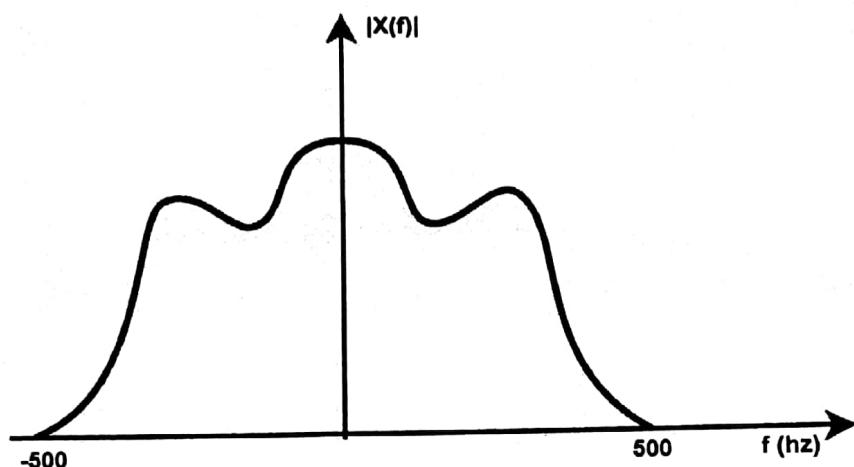
$$(iii) \quad x_3(n) = x(-n)$$

- C. Compute** the causal signal $x(n)$ if its z-transform $X(z)$ is given by

$$X(z) = \frac{1 - az^{-1}}{z^{-1} - a}$$

Q# 2 [CLO1/PLO1]

Apply the time and frequency domain techniques for sampling and reconstruction of signals to answer the following:

**Figure 1**

- What is the bandwidth and Nyquist rate for $x(t)$?
- Suppose the signal is sampled at the following two frequencies: $F_{s1} = 750 \text{ Hz}$ & $F_{s2} = 1200 \text{ Hz}$. Sketch the spectrum of the sampled signal (at both frequencies). Also determine if it is possible to reconstruct the signal at both sampling frequencies. Provide reasoning to support your answer.

Q# 3 [CLO2/PLO2]

[4 Marks]:

Diagram the Direct Form I and Direct Form II structure of the IIR Filter described by the following difference equation.

$$y(n) = 0.5y(n-1) - 0.76y(n-2) + 0.63y(n-3) + x(n) + 0.875x(n-1)$$

Q# 4 [CLO2/PLO2]

[6+5+3 = 14 Marks]

A. Consider the following sequences:

$$x_1(n) = \{11, -5, -2\}$$

$$x_2(n) = \{-4, 8\}$$

Relate the concepts of DFT to compute the linear convolution of the two sequences $x_1(n)$ and $x_2(n)$ by using the DFT. Also verify your answer by computing their linear convolution through traditional method.

B. Determine the FFT of the following sequence using Radix - 2 DIT algorithm. Butterfly diagram should be clearly drawn, explicitly stating the twiddle factors.

$$x_3(n) = \{-7, 0, 8, -11\}$$

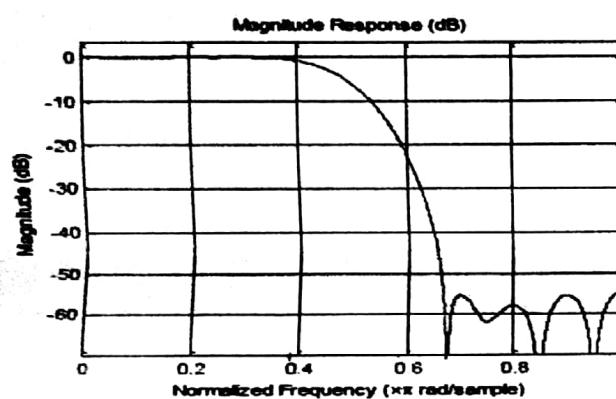
C. Given that $N = 512$, determine & compare the complex multiplications required in Direct DFT Computation as compared to FFT algorithm. Determine the speed improvement factor as well.

Q# 5 [CLO3/PLO3]

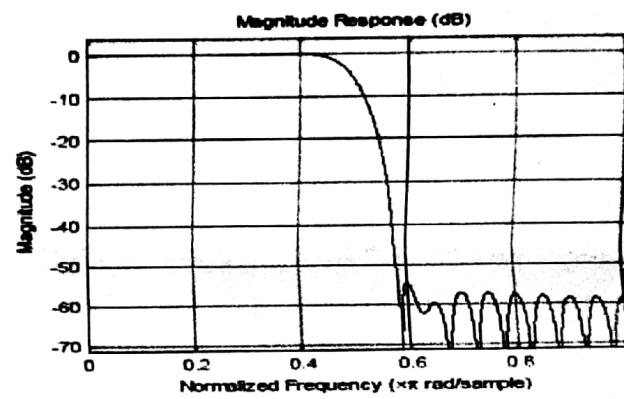
[6+7+6 = 19 Marks]:

A. Plots below show magnitude responses of two pairs of filters. One pair was designed using the same window but different orders, whereas the other pair was designed using the same order but different windows. (Hint: Filter Order = Filter Length - 1)

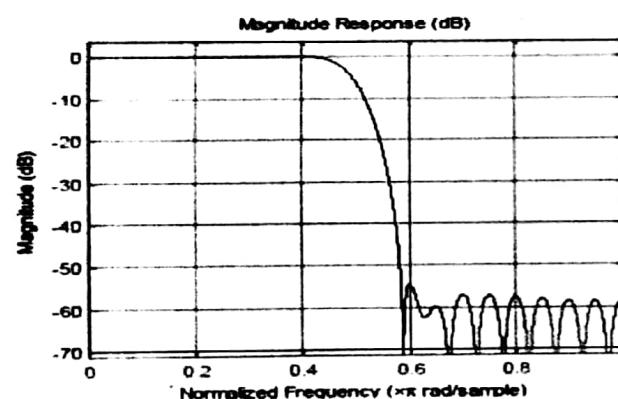
- (i) Which of the filters was designed using different orders? Also identify the window/windows, justifying your answer.
- (ii) Identify the two windows which were used in the design of filters, justifying your answers.



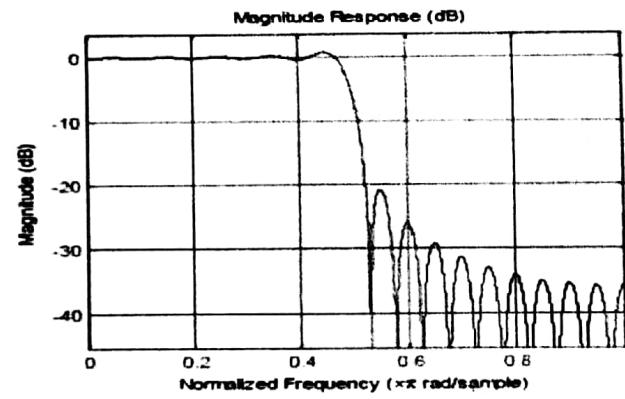
Pair 1



Pair 1



Pair 2



Pair 2

B. Design a low pass FIR digital filter using window method. Filter has cut-off frequency equal to 0.3π with the following specifications:

$$0.95 < H(\omega) < 1.05, \quad 0 \leq |\omega| \leq 0.25\pi, \quad -0.1 < H(\omega) < 0.1, \quad 0.35\pi \leq |\omega| \leq \pi$$

Making use of the following facts about window-based design method:

- Peak error in both the pass band and the stop band must always be same.
- Width of main lobe of window is approximately equal to transition band of the filter.

- Determine which of the listed windows in the above table can be used to meet these specifications?
- For each window that can be used, determine the minimum value of M required for the filter.

Different available windows with properties are given below:

Window Type	Peak side lobe amplitude (relative)	Approximate width of main lobe
Rectangular	-13 dB	$\frac{4\pi}{M}$
Bartlett	-25 dB	$\frac{8\pi}{M}$
Hann	-31 dB	$\frac{8\pi}{M}$
Hamming	-41 dB	$\frac{8\pi}{M}$
Blackman	-57 dB	$\frac{12\pi}{M}$

C. Design a discrete-time low pass filter applying Impulse Invariance, $h[n] = T h_c(nT)$, (assuming that aliasing will not be a problem) to continuous time Butterworth filter having the following magnitude-squared function:

$$|H_c(\Omega)|^2 = \frac{1}{1 + \left(\frac{\Omega}{\Omega_c}\right)^{2N}}$$

To meet the following specifications for discrete-time filter, compute and sketch the following:

$$\begin{aligned} \underline{0.899} &\leq |H(\omega)| \leq 1 & \text{for } 0 \leq |\omega| \leq 0.34\pi \\ |H(\omega)| &\leq \underline{0.099} & \text{for } 0.75\pi \leq |\omega| \leq \pi \end{aligned}$$

- The corresponding tolerance bounds on $|H_c(\Omega)|$, Ω_s and Ω_p
- The integer order N such that $|H_c(\Omega)|$ meets the specifications in part (i).
- Plot the poles of designed continuous-time Butterworth filter in s-plane.