COMSATS University Islamabad, Lahore Campus
Block–B, Department of Computer Engineering
COMSATS University Islamabad, Lahore Campus 1.5KM Defence Road, Off Raiwind Road, Lahore

Complex Engineering Problem

Course Title:	Data Communication & Computer Networks				Course Code:	CPE314	Credit Hours: 4(3,***1***)
Course Instructor/s:	Modassir Ishfaq				Programme Name:	BCE	
Semester:	6th	Batch:	Fa22	Section:	A&B	Date:	
Time Allowed:	**Specified in Table 1**				**Maximum Marks:**		**50**
Student's Name:					Reg. No.		

Mobilink Pakistan is in process of hiring you as their network solutions architect. To qualify for the job, you are required to **analyze** the sample network topology provided as an attachment to this document, thoroughly understand the listed requirements and provide your expert insights:

1. Staff at the IT department should be able to ping and establish telnet connection with all users in the network. But users in other networks should only be able to ping the IT department staff and nothing else.
2. Only messages related to ICMP, DNS, DHCP and HTTP be allowed to pass through to Network Operations Core. Rest of the traffic must be filtered.
3. Any switch present in IT department must be secured against the intruders. Effected ports must shutdown in case of any violation.
4. Ensure STP is enabled and working in the SMT network and provide your observations in the documentation.
5. SMT department in Area 1 has 5 users for postpaid subscribers management and 4 users for prepaid subscribers management. Configure VLANs accordingly.
6. Operations and maintenance department(OMD) must not be able to connect to the users of Postpaid Subscriber management team of SMT department in Area 1.
7. Operations and maintenance department (OMD) must not have access to the webserver placed in NOC.
8. Access of Postpaid Billing (PB) department is restricted for Prepaid Subscriber Management Team
9. Users of all departments must get their IP v4.0 addresses allocated via DHCP server in NOC
10. DNS services must be configured properly and accessible wherever not restricted
11. Multi-area OSPF must be configured for the whole network with an emphasis on route summarization
12. IP addresses must be allocated with least wastage as a top priority
13. No two serial links must have the same bandwidth.
14. Provide cost analysis of at least 3 routes (select source and destination of your choice)

Design the network as per the requirements illustrated above using CISCO Packet Tracer.

Following items are included in the deliverables:

Table 1

S. No.		Deliverables	Key notes	Submission Date
1		**Simulation / Packet Tracer Implementation (Evaluation Criteria: Software Rubric)**	File	12-06-2025
2		**Final Report (Evaluation Criteria: Report Rubric)**	**As per requirement**	12-06-2025
	A	Table of Contents / List of Figures must be present	Proper ToC using MS Word features	
	B	Comprehensive Implementation Details	For each set of requirements	
	C	Connectivity Verification Report	Trace routes/pings	
	D	Servers' (HTTP, DNS, DHCP) operability report	Configuration details + screenshots illustrating they're operational	
	E	Challenges/Difficulties	If applicable	
	F	Suggestions for alternative implementation methods		
	G	Must include an Appendix for commands executed on CISCO devices & servers		

Software Evaluation Rubric

Criteria	Exceeds Expectations (4)	Meets Expectation (3)	Developing (2)	Unsatisfactory (1)
Ability to use software	Student was familiar with the software and was able to use additional features of the software that were not available in instruction set.	Student was familiar with the software and required minimal help from the instructor to perform the experiment	Student demonstrated an ability to use the software but required assistance from the instructor	Student demonstrated little or no ability to perform experiment and required unreasonable amount of assistance from instructor
Ability to follow procedure and/or design a procedure for experiment	Student followed the instructions with no assistance student performed additional experiments or tests beyond those required in instructions if procedure to accomplish an objective in not provided, the student developed a systematic set of tests to accomplish objective	Student followed instructions in the procedure with little or no assistance if procedure was provided, the student was able to determine an appropriate set of experiments to run to produce usable data and satisfy the objectives	Student had difficulty with some of the instructions in the procedure and needed clarification from the instructor if procedure was not provided, the student needed some direction in deciding what set of experiments to perform to satisfy the objective	Student had difficulty reading the procedure and following directions if procedure was not provided, student was incapable of designing a set of experiments to satisfy given objective the data taken was essentially useless
Ability to troubleshoot software	Student developed a good systematic procedure for testing software code that allowed for quick identification of problems student good at analyzing the data	Student demonstrated the ability to test software code in order to identify technical problems, and was able to solve any problems with little or no assistance	Student was able to identity the problems in software code but required some assistance in fixing some of the problems	Student demonstrated little or no ability to troubleshoot software code.
Q & A	Able to explain program design and fundamental concepts correctly	able to explain most of the program design and relevant fundamental concepts	able to explain some program design and relevant fundamental concepts	unable to explain program design or answer relevant fundamental concepts

Report Evaluation Rubric

Criteria	Exceeds Expectations (4)	Meets Expectation (3)	Developing (2)	Unsatisfactory (1)
Data Presentation	Student demonstrates diligence in creating a set of visually appealing tables and/or graphs that effectively present the experimental data	Experimental data is presented in appropriate format with only a few minor errors or omissions	Experimental data is presented in appropriate format but some significant errors are still evident. Tables could be better organized or some titles, labels or units of measure are missing.	Experimental data is poorly presented. Graphs or tables are poorly constructed with several of the following errors: data is missing or incorrect, units are not included, axis not labeled, or titles missing.
Data Analysis	Student provides a very focused and accurate analysis of the data. All observations are started well and clearly supported by the data	Student has analyzed the data, observed trends, and compared experimental results with theoretical results Any discrepancies are adequately addressed All expected observations are made.	Student has analyzed the data, observed trends, and compared experimental results with theoretical results Any discrepancies are not adequately addressed Some observations that should have been made are missing or poorly supported	Student has simply restated what type of data was taken with no attempt to interrupt trends, explain discrepancies or evaluate the validity of the data in terms of relevant theory Student lacks understanding of the importance of the results
Writing Style	CEP report has no grammatical and/or spelling errors. All sections of the report are very well written	CEP report has very few grammatical and/or spelling errors the sentence flow is smooth	CEP report has some grammatical and/or spelling errors and is fairly readable Student makes effective use of technical terms	CEP report has several grammatical and/or spelling errors and sentence construction is poor