Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India

(Autonomous College Affiliated to University of Mumbai)

End Semester Examination - Synoptic

2019–20

Max. Marks: 60 | Duration: 180 Min

Class: T.E. | Semester: V

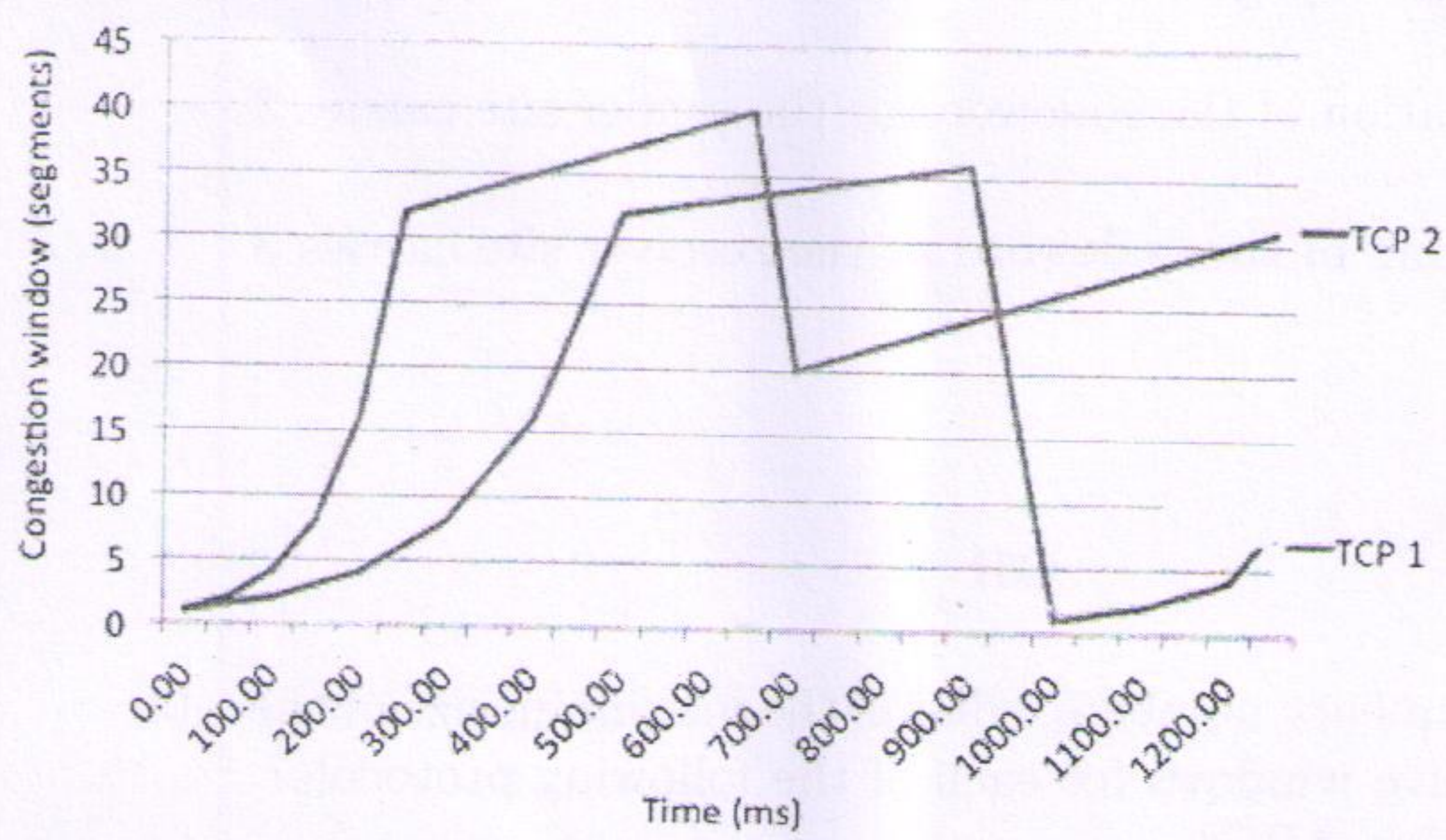
Course Code: CE51 | Branch: Computer Engineering

Name of the Course: Data Communication and Computer Networks

Instruction:

(1) All questions are compulsory.
(2) Draw neat diagrams and keep your answers clear and concise.
(3) Assume suitable data if necessary.
(4) Note there is no fractional marks for partly correct answer.

Q No.	Question	Max. Marks	CO-BL-PI
Q.1 (a)	Given the dataword 1010011110 and the divisor 10111, i) Show the generation of the codeword at the sender site (using binary division). ii) Show the checking of the codeword at the receiver site (assume no error). **Answer:** Correct generation of the codeword at the sender site carries 3 marks. Correct checking of the codeword at the receiver site carries 3 marks.	06	3-3-2.1.2
	OR		
	Using 5-bit sequence numbers, what is the maximum size of the send and receive windows for each of the following protocols? i) Stop-and-Wait ARQ ii) Go-Back-N ARQ iii) Selective-Repeat ARQ **Answer:** Finding maximum size of the send and receive windows for each of the following protocols 2 marks. Finding maximum size of the send and receive windows of three protocols carry 6 marks.	06	4-3-2.1.2
Q.1 (b)	Compare and contrast the Go-Back-N ARQ Protocol with Selective-Repeat ARQ. **Answer:** Each correct comparison carries 2 marks. Three comparisons carry 6 marks.	06	4-4-2.4.2

Q.2 (a)	An organization is granted the block 211.17.180.0/24. The administrator wants to create 32 subnets. i) Find the subnet mask. ii) Find the number of addresses in each subnet. iii) Find the first and last addresses in subnet 1. iv) Find the first and last addresses in subnet 32. **Answer:** Each correct answer to sub-question carries 1.5 marks. Four sub-questions carry 6 marks. OR Show the fragmentation process of a datagram with a size of 4000 bytes (0-3999) in three fragments. Each fragment maximum size is 1400 bytes. Show all flag fields relevant to fragmentation of all datagram fragments. **Answer:** Each fragment details of all flag carries 2 marks. Three fragments details of all flag carries 6 marks.	06 06	 4-3-2.3.1
Q.2 (b)	Differentiate between Distance Vector Routing and Link State Routing. **Answer:** Each correct comparison carries 2 marks. Three comparisons carry 6 marks.	06	4-1-2.4.1
Q.3 (a)	For this problem consider Figure 4 and answer the following questions. In all cases provide a short discussion justifying your answer 	06	4-3-2.2.3

	the TCP1 transmission, identify the time intervals when TCP slow start is operating. **Answer:** 0-500 and 1000-1300 ii) For the TCP2 transmission, identify the time intervals when TCP slow start is operating. **Answer:** 0-200 iii) For TCP1 transmission, identify the time intervals when congestion avoidance is operating. **Answer:** 500-900 iv) For TCP2 transmission, is the segment loss detected by triple duplicate ACK or by timeout? **Answer:** Triple duplicate ACK v) What is the initial value of ssthresh? **Answer:** 32 vi) There are two ways to terminate a TCP connection, what are they? **Answer:** The normal way to terminate a TCP connection is with a FIN/ACK sequence – a two-way close with all sent bytes being delivered and ACKed. Another way to terminate a TCP connection is with a reset (RST flag set). In this case, any data in transit may not be fully delivered (i.e., may be lost unknown to the sender).		
Q.3 (b)	i) How traffic characterization in leaky bucket differ from token bucket **Answer:** Simple theory question. ii) Consider the arrival traffic characterized by a token bucket with the following parameters: r (average rate) = 5 Mbps, R (maximum rate) = 10 Mbps, and b (token depth) = 100 Kb. Compute the duration of time for which a flow can send at rate R before exhausting its tokens. **Answer:** The flow starts with a bucket containing b tokens. Those tokens are drained at a rate R and replenished at a rate r. Thus, we solve the equation b - R x t + r x t = 0 for t, where t represents time. This simplifies to t = b/(R - r). Using the numbers above, this gives us 102, 400b=(10,000,000bps – 5,000,000bps) = 1,024/50,000sec or 10/500sec or 10/512sec, depending on what size conventions you use. iii) Using your previous answer, compute the number of bits transmitted before the flow depletes its tokens. **Answer:** The flow sends at a rate R, and we know the duration from a). If we use the general equation from the previous part, we have R x b/(R - r). Using the numbers above, 10,000Kbps x (10/500sec) = 200Kb.	06	4-3-2.2.3

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<td>Q.4 (a)</td>
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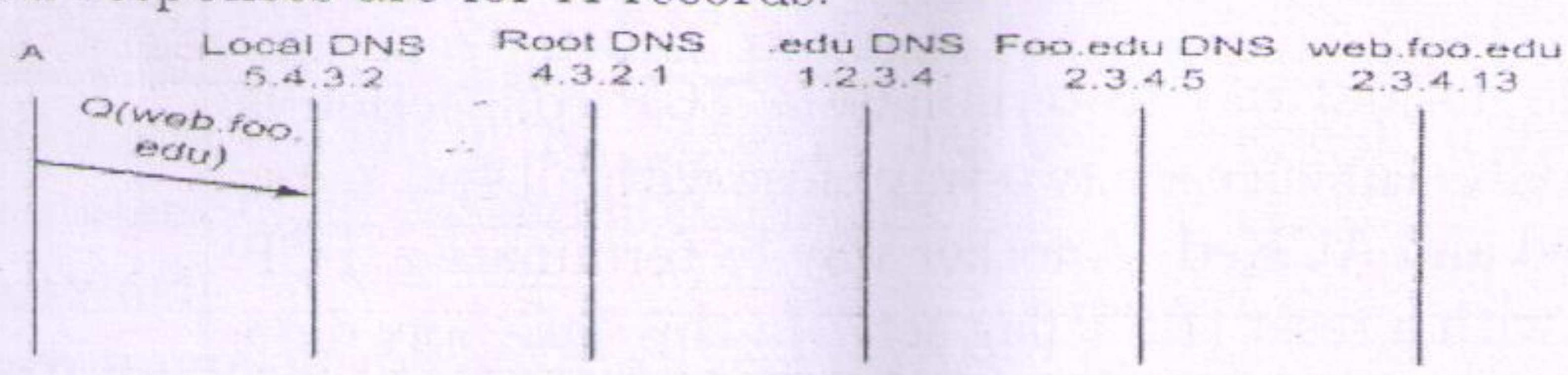
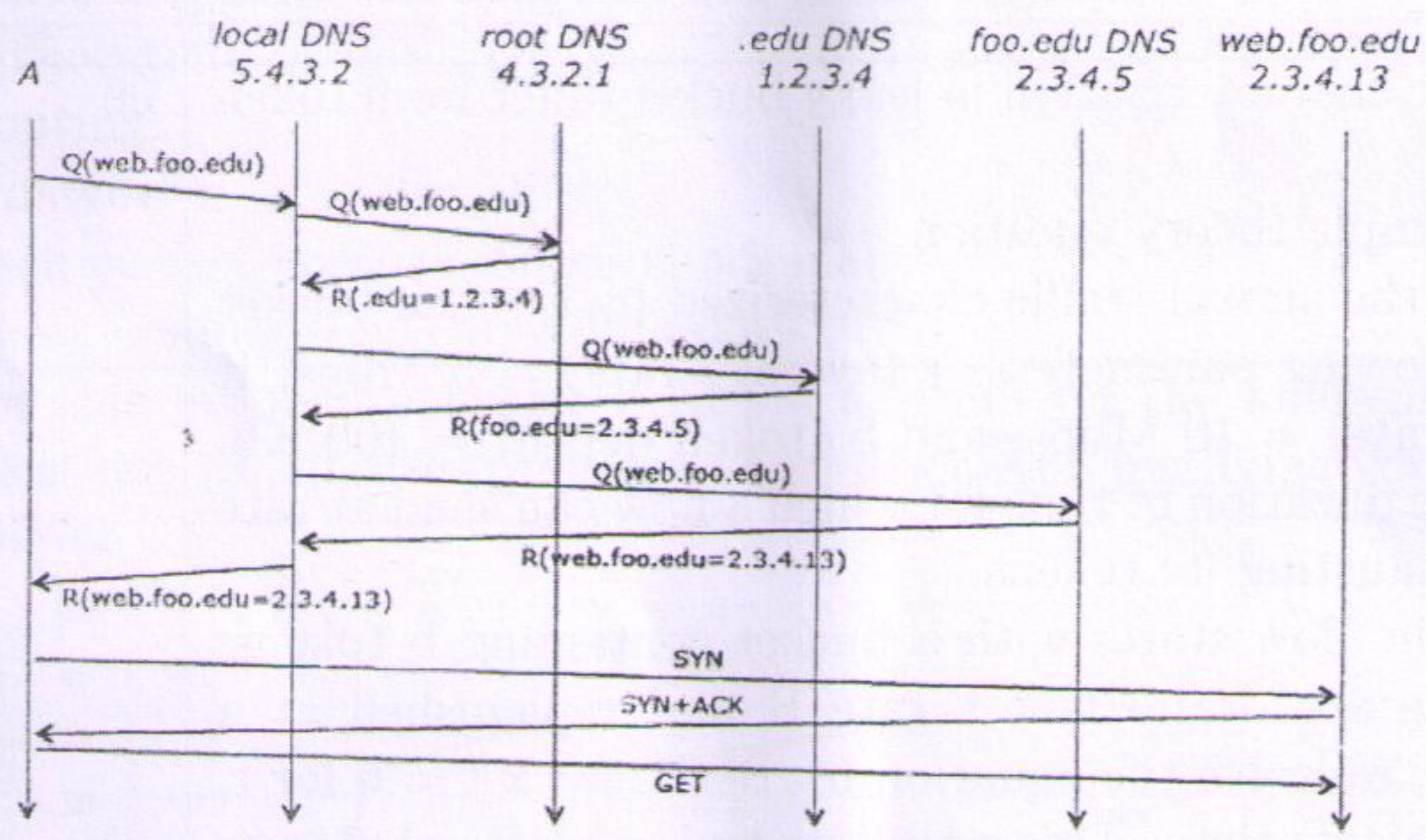
i) The diagram below shows a DNS query from a host A to its local DNS server. The IP addresses of all hosts are shown in the diagram. The label "Q(web.foo.edu)" specifies the query string. Complete the diagram showing all packets sent to resolve the name and continuing through the opening of a TCP connection to the web site and the first GET request. All arrows that represent DNS queries should have a label of the form "Q(a.b.edu)" and replies should have a label of the form "R(b.edu=2.3.7.11)". TCP connection packets should be labeled with the appropriate flags and HTTP packets with the request type. Assume that the local DNS server performs recursive processing and has nothing in its cache, while the others perform iterative processing. You may assume that all queries and responses are for A records.



Answer:



ii) List all the mappings in the local DNS server's cache after the query has been processed.
Answer: *.edu=>1.2.3.4, foo.edu=>2.3.4.5, web.foo.edu=>2.3.4.13*

iii) List the mappings in the local server's cache if the .edu server did recursive processing rather than iterative.
Answer: *.edu=>1.2.3.4, web.foo.edu=>2.3.4.13*

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<td>Q.4 (b)</td>
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Suppose Wallace wants to send email message to Gromit. This will involve 4 entities: Wallace's mail client (for email composition and sending), Wallace's outgoing mail server, Gromit's incoming mail server and Gromit's mail client (for email retrieving and viewing). Between which of these four entities SMTP protocol will operate? What about the IMAP protocol? Draw suitable schematic diagram and explain.

Answer:

SMTP between Wallace mail client and mail server and also between his server and Gromit's server. IMAP between Gromit's server and his mail client to retrieve messages from Gromit's server.

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	OR		
Q.4 (a)	A user in Mumbai, connected to the internet via a 100 Mb/s (b=bits) connection retrieves a 250 KB (B=bytes) web page from a server in Singapore, where the page references three images of 500 KB each. Assume that the one way propagation delay is 75 ms and that the user's access link is the bandwidth bottleneck for this connection. i) Approximately how long does it take for the page (including images) to appear on the user's screen, assuming non-persistent HTTP using a single connection at a time (for this part, you should ignore queueing delay and transmission delays at other links in the network)? **Answer:** *4*(300) ms + (2 + 3*4 Mb)/(100 Mb/s) = 1200 ms + 140 ms = 1.34 seconds* ii) How long does it take if the connection uses persistent HTTP (single connection)? **Answer:** *3*150 ms + 140 ms = 590 ms* iii) Suppose that user's access router has a 4 MB buffer (B=byte) on the link from the router to the user. How much delay does this buffer add during periods when the buffer is full? **Answer:** *A 4 MB buffer is 32 Mbits, so it adds 320 ms to the delay on a 100 Mb/s link.*	06	4-3-2.2.3
Q.4 (b)	What is the primary difference between HTTP 1.0 and HTTP 1.1? Draw suitable diagram with notations. Draw suitable figure and Explain the difference carefully, not just name it. What is the benefit of this difference? **Answer:** HTTP 1.1 support persistent connections. This means that a single TCP connection can transfer multiple images or other embedded objects in an HTML page if they all come from the same server. With HTTP 1.0 a new TCP connection is established for each object. The benefit of the persistent connection is to achieve faster transfer because only one slow-start phase is needed for all objects transferred (and not one slow start per object).	06	4-2-2.2.2

Q.5 (a)	**Answer any TWO ONLY** i) Name the layer of OSI reference model where following protocol services running HTTP, FTP, SMTP, DNS, ICMP, OSPF, TLS, TCP, ICMP, IGMP **Answer:** Application (HTTP...DNS), Network, Session, Transport, Network ii) Suppose we send into the Internet two IP datagrams, each carrying a different UDP segment. The first datagram has source IP address A1, destination IP address B, source port P1. and destination port T. The second datagram has source IP address A2, destination IP address B,source port P2, and destination port T. Suppose that A1 is different from A2 and P1 is different from P2. Assuming that both datagrams reach their final destination, will the two UDP datagrams be received by the same socket? Why or why not? Justify your answer. **Answer:** Yes they will pass through the same socket, because UDP sockets are identified by two tuples: destination IP and port. iii) For each of the following, annotate it with "IS" if it applies to Integrated Services (IntServ), "DS" if it applies to Differentiated Services (DiffServ), and "BE" if it applies to Best Effort. (A given statement can apply to more than just one type of service.) a) Among the three, requires the most state in routers. **Answer:** IS. IntServ requires the most state, since it needs to track individual flows or connections. DiffServ only needs to maintain per-class state, of which there are not many classes. Best Effort doesn't maintain any state. b) Is widely available in the Internet today. **Answer:** BE (with DS also being allowed in addition). Best Effort is the only end-to-end service widely available today. We also discussed how DiffServ is frequently available within individual domains, though usually not between domains. Because the question wasn't clear on just what constitutes "widely available," answers that included DiffServ too were allowed. c) Provides isolation and guarantees among aggregated flows but not individual connections. **Answer:** DS. DiffServ operates on large aggregates. IntServ provides fine grained isolation and guarantees (which makes it more difficult to deploy, since it requires more state). Best Effort doesn't provide any isolation or guarantees, period.	06	
Q.5 (b)	**Answer Any TWO only**	06	
	i) State the control fields of I-Frame, S-Frame and U-Frame of HDLC protocol. **Answer:** Control fields of three frames carries 3 marks.		1-1-2.3.1
	ii) Differentiate between RIP and OSPF. **Answer:** Each correct comparison carries 1 mark. Three comparisons carry 3 marks.		4-4-2.3.1

	...emplify NRZ-L and NRZ-I Line Coding Schemes ...nswer: Example of each Line Coding Scheme carries 1.5 marks. Two examples of two Line Coding Scheme carry 3 marks.		5-3-2.3.1