K.S. INSTITUTE OF TECHNOLOGY, BANGALORE - 560109
I SESSIONAL TEST QUESTION PAPER 2019 – 20 ODD SEMESTER

SET – A/B

USN										

Degree : **B.E** **Semester** : **V**
Branch : **Computer Science & Engineering** **Course Code** : **17CS52**
Course Title : **Computer Networks (Sch & Ans** **Date** : **11-Sep-2019**
Duration : **90 Minutes** **Max Marks** : **30**

Note:
1. **Answer ONE full question from each part.**
2. **This is an open book exam. Any printed material, handwritten notes etc. is allowed.**
3. **Sharing of books, notes, printed material is not permitted.**
4. **Use of calculator is permitted, but no other electronic gadget is permitted.**

Q No.	Question	Marks	CO mapping	K-Level
	PART-A			
1(a)	Assume that your college network permits only outgoing traffic to port 80 (web) and port 21 (FTP). On your college website (www.ksit.edu.in), there is student registration form (of size 2KB) to be downloaded (which does not require any authentication) by each student. It can be downloaded either using HTTP or using FTP. HTTP protocol has headers overhead of 1500 bytes (500 bytes of request header and 1000 bytes of response header) where as FTP protocol has overhead of only 200 bytes (100 bytes of request and 100 bytes of response). As a student you can **select** either HTTP or FTP to download this form. Which protocol you would select and **explain** why.	**5**	**CO1**	**Applying**
Sch & Ans	Sch: 1marks for right selection, 4 marks for explanation Ans: Selection: HTTP Since FTP involves data channel for data transfer, and firewall allows on port 21 traffic (control channel), thus FTP is not a feasible option to download. Only possibility is HTTP.			
(b)	Consider that an underlying communication network guarantees following properties: a) In order delivery, b) Error free (no packet corruption) delivery c) Loss free delivery (No packet loss occurs) i. A transport layer communication protocol uses RDT 1.0 protocol to provide reliable communication. **Identify** the flaw of using RDT 1.0 with this network. ii. **Design** the protocol RDT 1.1 enhancing RDT 1.0 to provide reliable communication	**5**	**CO2**	**Analyzing**
Sch & An	Sch: 2marks for identifying flaw, 3 marks for designing 1.1 Ans: The flaw is underlying network channel can still duplicate the	**S**		

	packets. Thus, receiver need to check if it is a duplicate packet. Thus, RDT 1.1 will involve following. Each packet should be identified by a sequence number whose value can be 0 or 1. Since channel always delivers in order, thus if pkt 1 is duplicated and delivered, all such duplicate packets will be delivered before next pkt with seq number 0 is delivered. No ack or Nack is required. Thus, sender will have two states S1: Wait for pkt for Seq number 0 S2: Wait for pkt for seq number 1 Similarly, receiver will have two states S1: wait for pkt number 0. If pkt number 1 is received, discard the same. S2: Wait for pkt number 1. If pkt number 0 is received, discard the packet.			
(c)	Suppose that users share a common 4 Mbps link. Also, suppose that each user transmits only 25% of the time, but when transmits data, transmits continuously at the rate of 1Mbps. Given this network setup, **calculate** the following: i. When circuit switching is used, how many users can be supported. ii. Suppose there are total of 5 users using this network using packet switching. **Determine** the probability that there will be no queuing?	**5**	**CO4**	**Analyzing**
Sch & An	Sch: 1 mark for circuit switch, 4 marks for packet switching Ans Since common link is 4Mbps, only 4 users can be supported in circuit switching. Queueing will occur when all 5 users transmit simultaneously. The probability of all 5 users transmitting concurrently is (1/4)**5=1/1024 Thus probability of no queuing is 1-1/1024.			
	OR			
2(a)	Suppose you are using POP3 to download the emails to your desktop (client) from a mail server using username as CSE and password as KSIT. Consider that before starting the session, your mailbox on the server has 3 emails (from sender S1, S2 and S3). A client interacts with the server using POP3 to retrieve the emails as follows: i. In the first session, client retrieves 1st and 3rd email and deletes the last one. **Construct** the protocol communication (commands) in proper sequential order to achieve the session activities. ii. Before 2nd POP3 session starts, 3 new emails (from sender S2, S3, and S4) have been added to the mailbox on the server. In the second session, user delete first email, and then retrieve first 3 emails. **Construct** the protocol communication (commands) in proper sequential order to achieve the session activities, and **identify** the sender from which emails will be seen by the user.	**5**	**CO1**	**Applying**

Sch & An	Sch: 2 marks for commands for first session, 3 marks for 2nd session. Ans: 1st session: USER CSE +OK PASS KSIT +OK LIST 1 nnn (from S1) 2 nnn (from S2) 3 nnn (from S3) . RETR 1 … (mail data from S1) RETR 3 … (mail data from S3) QUIT 2nd session USER CSE +OK PASS KSIT +OK LIST 1 nnn (from S2) 2 nnn (from S2) 3 nnn (from S3) 4 nnn (from S4) . DELE 1 RETR 2 … data (from S2) RETR 3 … data (from S3) .RETR 4 … data (from S4) QUIT			
(b)	Consider the case of a network where underlying network channel does not corrupt the packet, does not provide out of order delivery, does not replicate packets, but loses every 3rd packet (in each direction). For example, if A sends 3 packets to B, 3rd packet transmission from A to B will be lost and 3rd ack from B to A will be lost. You have been asked to design a reliable transport communication on this network channel (you only know that network may lose some packets). An application uses your reliable transport protocol to transmit 5 packets. **Establish** the timeline sequence diagrams demonstrating reliable delivery of 5 packets.	**5**	**CO2**	**Analyzing**
Sch & An	5 marks for time line seq diagram A→B (Pkt 1) B←A (Ack 1) A→B (Pkt 2)			

	B←A (Ack 2) A→B (Pkt3) Pkt3 is lost Timer times out, A→B (Pkt3) B←A (Ack 3),,, Ack is lost Timer times out, A→B (Pkt3) B←A (Ack 3) A→B (Pkt4) … Pkt4 is lost Timer times out, A→B (Pkt4) B←A (Ack 4) A→B (Pkt5) B←A (Ack 5)… Ack is lost Timer times out, A→B (Pkt5) Pkt5 is lost Timer times out, A→B (Pkt5) B←A (Ack 5			
(c)	The web server of KSIT displays a logo, stored in a image file `ksitlogo.png` created on 19-Aug-2019. The web development team created a new logo on 05-Sep-2019 and deployed it on the webserver on Sep 06, 2019. A student has accessed the web page and on Sep 07, 2019 and the browser has cached this logo with expiry period of 1 year. The web admin found some faults with the new logo on Sep 08, 2019 and restored the old logo having creation date of 19-Aug-2019. When the same student accessed KSIT website on Sep 09, 2019, browser still displayed the new logo (faulty) and not the old one. As a web expert, you need to **dissect** the issue and **solve** it. **Explain** your approach.	**5**	**CO4**	**Analyzing**
Sch & An	Sch: 2 marks for dissecting the issue, 3 marks for solving it. Ans Since the old logo is restored, it has Last-Modified Date of Aug 19. Since user has cached the date of Sep 06, 2019, and when this date is sent as part of If-Modified-Since header, the web server returns status code 304 and user display the new logo. The solution is not to use Last-Modified-Date in response header but instead use the Etags header.			
PART-B				

3(a)	For a web request, given below are request and response headers.
	<u>Request headers</u>
	`GET /cse_dept.html HTTP/1.1`
	`Host: www.ksit.ac.in`
	`Connection: keep-alive`
	`Upgrade-Insecure-Requests: 1`
	`DNT: 1`
	`User-Agent: Mozilla/5.0 (Macintosh; Intel Mac`
		5	**CO1**	**Applying**

	OS X 10_14_6) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/76.0.3809.132 Safari/537.36 Accept: text/html,application/xhtml+xml, application/xml; q=0.9, image/webp,image/apng,*/* Referer: http://www.ksit.ac.in/ Accept-Encoding: gzip, deflate Accept-Language: en-US,en;q=0.9,hi;q=0.8 Response Headers HTTP/1.1 200 OK Server: nginx/1.10.3 (Ubuntu) Date: Thu, 05 Sep 2019 16:55:26 GMT Content-Type: text/html;charset=iso-8859-1 Transfer-Encoding: chunked Connection: keep-alive X-Content-Type-Options: nosniff X-XSS-Protection: 1; mode=block Cache-Control: no-cache, no-store, max-age=0, must-revalidate Pragma: no-cache Expires: 0 X-Frame-Options: DENY Content-Language: en-US Content-Encoding: gzip **Examine** these headers and answer the following i. **Identify** the URL request made by the browser ii. **Determine** if this web page was accessed by typing the URL or by clicking on a link on an existing web page. iii. **Identify** if the content of this web page is cached by the browser and if yes, for how long iv. **Identify** the operating system of the machine where web server is running v. As there is no `Content-Length` header field in the response, when and how does browser **determine** that content has been fully received			
Sch & An	Sch: 1 mark for each part Ans i. URL entered is http://www.ksit.ac.in//cse_dept.html ii. Since request headers contains the header Referrer:, this implies that user clicked on a link in existing page. iii. Cache-Control header in response has the attribute no-store, and further expires:0, it implies that this page can't be cached by the browser. iv. The web server is running Ubuntu, identified from the response header Server v. The response header Transfer-Enccoding: chunked implies that contents are received in chunks and the content size is determined from chunk size.			

(b)	Consider 3 systems A, B and C with their IP addresses respectively configured as 144.160.176.129, 144.160.176.140, and 144.160.176.158. Your network teacher has asked you to **design** subnet scheme such that A can communicate with both B and C, but B and C can not communicate with each other. **Explain** the working your subnetting scheme.	**5**	**CO3**	**Applying**
Sch & An	Sch: 3 marks for designing subnet, 2 marks for explaining. Ans: Subnet mask for A, B and C will be /27, /28 and /27, Both A and C has same subnet mask and have same subnet number 144.160.176.128/.27 and broadcast address and thus A and C can talk. The network number for B is 144.160.176.128/28, and its last assignable address is 144.160.176.142. Thus from perspective of B, C is in a different network and thus B and C can not communicate			
(c)	Consider that AICTE India is witnessing high traffic for their website www.aicte-india.org. To provide a better user experience, it has deployed the web servers in each of the 28 states of India, and wants a design a mechanism by which client browsers should be served contents from the web server of the respective state from where request is made. All browsers access the main URL i.e. http://www.aicte-india.org to visit the website. As an IT admin of AICTE, your job is to **develop** a mechanism to achieve this objective with following approaches. i. Using features of HTTP protocol ii. Using features of DNS protocol iii. **Compare** the above two mechanisms w.r.t. performance i.e. which one is expected to provide better user experience	**5**	**CO4**	**Analyzing**
Sch & An	Sch: 2 marks for HTTP, 2 marks for DNS, and 1 mark for comparison i. HTTP: all the browsers resolve the IP to a single IP Address which goes to central HTTP server. The central HTTP server redirects the request to web server of respective state from where user is coming from. For example, for Karnataka state, redirected hostname can be https://kn.aicte-india.org/ . ii. DNS server identifies the state from where user is requesting and based on user location and responds with IP address of web server for that state. This is called DNS based load balancing. iii. Since in HTTP case, there 1 redirect involved, thus requiring 2 HTTP Requests, DNS based implementation would be more efficient.			
	OR			
4(a)	Consider that your IT team has created two dynamic web pages `hello1.cgi` and `hello2.cgi` and deployed these on the web server. A user accesses these two web pages and first one is displayed with a properly formatted output like below	**5**	**CO1**	**Applying**

	Hello
	
	The second web page `hello2.cgi` is displayed on the browser window as raw content as given below (though IT team expected that it should be displayed with formatted output similar to that of first web page `hello1.cgi`)
	`<html>`
	`<b>Hello</b>`
	`</html>`
	
	The IT team is unable to diagnose the issue. As an HTTP protocol expert, how would you **identify** the problem and **solve** it.			

Sch & An	Sch: 2 marks for identifying the issue and 3 marks for solving it. The issue is in 2nd CGI case, the content-type header is sent as Text/Plain whereas first CGI Request sends this header has text/html. The solution lies in changing the content-type header for 2nd cgi.			
(b)	Consider that your IT friend has just learnt IP addressing and subnetting and configured two machines A and B with their respective IP addresses as 145.161.180.193/20 and 145.161.200.193/20. Your friend claims that both belongs to same subnet but complains that two machines are not able to communicate with each. Using your network knowledge expertise, **examine** these network addresses and subnet masks, and i. **Identify** flaws in the network addressing scheme. ii. **Develop** the subnet scheme (without changing the IP Addresses) such that two machines can communicate. Ensure to **design** minimum possible subnet size.	**5**	**CO3**	**Applying**
Sch & An	Sch: 2 marks for identifying flaws, 3 marks for solving it. Ans i. The network number for A is 145.161.176.0/20 and network number for B is 145.161.192.0/20 and thus two network numbers are different and hence two machines can not communicate. ii. The solution in changing the subnetting to /17 where both the machines will have there network number as 145.161.128.0/17.			
(c)	Consider a modified (described below) version of RDT 3.0 protocol where underlying network can corrupt as well as lose the packets. Consider that link bandwidth is 100Mbps and has propagation delay of 10ms. Each transmitted packet size is 1250 bytes. The modified version of RDT 3.0 allows two packets to be transmitted in a continuous manner i.e. 2nd packet can be transmitted without waiting for the ack of first packet. **Calculate** the utilization efficiency of modified RDT 3.0.	**5**	**CO4**	**Analyzing**
Sch & An	Sch: 1 marks for computing transmission delay, 1 marks for computing Propagation delay, 1 mark for computing total RTT And 2 marks for efficiency.			

	The packet loss doesn't affect the utilization efficiency at the first level. Transmission delay is $2*1250*8/(100*10^6) = 2ms$. Twice the propagation delay is 20ms. Thus total RTT is 22ms. The utilization efficiency is 2ms/22ms = 1/11 = 9.09%			

Signature of course in charge **Signature of Module Coordinator**

Signature of HOD **Signature of Principal**