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UNIVERSITY

STRATHMORE UNIVERSITY
FACULTY OF INFORMATION TECHNOLOGY
MASTER OF SCIENCE IN INFORMATION SYSTEMS SECURITY
END OF SEMESTER EXAMINATION
MST 8101: Mobile Computing

DATE: 04 August, 2015

Time: 3 Hours

Instructions: Answer Question One and any Two other Questions

Question 1

- (a) In TCP, assume Round Trip Time of 60 ms through a link with available bandwidth of 1 Gbps and segment size of 750 bytes.
- Determine the number of segments needed to use the full link capacity. Assume exponential increase from a cold start. *Hint: Determine the required congestion window size.* [3 Marks]
 - If a timeout occurs, how long will it take to fill up the link capacity? [5 Marks]
- (b) How is Dense Wave Length Division Multiplexing (DWDM) implemented in fiber optic communications? [2 Marks]
- (c) Simple Mail Transport Protocol (SMTP) is used to relay email between servers. Consider a scenario where a user called Mary sends an email to James. Assume Mary's email address is **mary@strathmore.edu** (server hosted by gmail.com) and James' email address is **jm@yahoo.com**. Use a diagram to illustrate the forwarding of email from Mary's computer (internet browser) to James' computer (outlook client). *Note: Show user agents, mail servers and where respective protocols are used.* [4 Marks]
- (d) Draw an outline diagram that depicts two mobile networks and use it to explain the concept of roaming. [6 Marks]

(Total 20 Marks)

Question 2

- (a) With respect to protocol details i.e. suitable addresses for each layer (Layer 2 and 3), use a diagram to illustrate the differences between routing of IP packets at layer 3 of TCP/IP reference model and forwarding of Ethernet frames between routers at layer 2 of TCP/IP reference model. [4 Marks]
- (b) Using a signalling diagram, explain the phases of establishing a TCP connection. [2 Marks]
- (c) The transport layer of TCP/IP reference model utilises sockets to establish inter-process communication between two applications. List and explain the 5 tuple attributes that define a socket. [5 Marks]
- (d) Hyper Text Transfer Protocol (HTTP) is a common protocol that is used for Internet communications. With respect to the TCP/IP reference model, illustrate how a message sent using HTTP is processed while being sent from an application on one computer to an application on another computer. *Note: Use a diagram in your discussion and indicate address types at each layer.* [4 Marks]

(Total 15 Marks)

Question 3

- (a) Use a diagram to explain the concept of mobile IP. Note: Show all key entities e.g. Home Agent etc. [5 Marks]
- (b) Synchronous Optical Networks (SONET) and Synchronous Digital Hierarchy (SDH) are the

main framing technologies that are used in fiber optic communications:

- i) Use a diagram to illustrate the outline of a SONET STS-1 frame. *Hint: Do not draw each row and column, but give the number of rows/columns and identify overheads.* [4 Marks]
 - ii) Calculate the data rate of an STS-1 signal. *Note: include all overheads.* [2 Marks]
 - iii) Calculate the data rate of an STS-3 signal. *Note: include all overheads.* [2 Marks]
 - iv) What are the values of pointer bytes H1 and H2 if an SPE starts at byte 420? [2 Marks]
- (Total 15 Marks)**

Question 4

- (a) List and explain 4 types of delay in packet switched networks. [4 Marks]
 - (b) Explain how TCP uses timeouts and acknowledgments to support reliable data transport. [2 Marks]
 - (c) Use a diagram to illustrate how WLAN networks use Carrier Sense Multiple Access with collision avoidance. [5 Marks]
 - (d) The network layer fragments messages that are too long to fit into the data link layer maximum transfer unit size. Using a diagram explain how tiny IP fragments can be used to launch an attack against a target that is protected by a firewall. [4 Marks]
- (Total 15 Marks)**