**Question 1**

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|  | 1. Describe the parameters monitored to provide Congestion Control and to provide Flow Control and how are they used? [10 marks]   List up the relevant parameters describing which is for each and how these are used.   1. Frames of length 1,000 bits are to be transmitted over the following links using the ‘stop and wait’ Flow Control mechanism. The velocity of propagation across these links is 2.5 x 108 m.s-1. For each link determine the link efficiency. 2. A 1,250 km link with a data transmission rate of 10 Gbps. [2 marks] 3. A 12.5m link with a transmission rate of 1 Mbps. [2 marks] 4. Propose a particular application for which the stop and wait flow control mechanism is suitable. Explain what advantages stop and wait has and suggest alternatives where stop and wait is not suitable. [6 marks]   i) Link Efficiency, U = {L/R}/ [RTT+ {L/R}]  L = 1000b, R=10 x109, d=2 x 1.25 x 106m = 2.5 x 106 m  {L/R} = 1x10-7s, RTT={2x1.25x106 /2.5x108} = 1x10-2.  U = {1x10-7}/{1x10-2 + 1x10-7} = ~1x10-5 ~ 0.001%]  ii) L =1000b, d = 25m, R = 1x106bps,  {L/R} = 103 / 106 = 10-3, RTT = 25/25 x107 = 1x10-7  U = 1x10-3/{1x10-3+1x10-7} = ~1 ~100%  iii)  Explain where Stop and Wait is efficient and mention which standard uses it. Describe what resources are needed to provide is compared to ‘go back n’ and ‘selective repeat’ and how and when they are better. Describe how these flow control mechanisms are used on the Internet. |
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**Question 2**

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|  | A key aspect of TCP is provision of a reliable data transfer (RDT) service. A ‘timeout interval’ is used in this provision.   1. Explain what part the ‘timeout interval’ plays in providing RDT. [4 marks]   Explain how timers are required and what part they play in providing RDT.   1. The round trip time (RTT) is measured and used in the calculation of the timeout interval. Explain what the RTT is, and how it is calculated. [7 marks]   Provide a description of how a useful RTT is calculated and the relationship used in this calculation.   1. Explain how the duration of the timeout interval is determined with reference to the RTT and any other parameters (especially with reference to TCP). [9 marks]   Explain use of variation in RTT and the actual calculation of the Timeout interval itself. |

**Question 3**

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|  | The Open Systems Interconnection (OSI) layered architectural model was developed by the International Standards Organisation (ISO) to describe communication systems.   1. What is the purpose of having such a layered model? [4 marks] 2. Specify, in the correct order, the layers of the ISO open systems interconnect model, with example functions performed at each layer. [8 marks] 3. Are there disadvantages of using a layered architecture? [3 marks] 4. In contrast to the OSI model describe the TCP/IP architectural model. [5 marks]   Question3.  (a) List up the reasons for having layered communications hierarchies.  (b) List the OSI layers with appropriate functions performed at each layer.  (c) Provide things that can be disadvantageous about layering.  (d) Compare OSI to the TCP/IP model by providing the TCP/IP layers with example functions and explanation of the differences. |

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| **Question 4** | The Internet is in a state of transition as it changes from using IPv4 to using IPv6.   1. What is the binary equivalent of IPv4 address: ‘64.54.34.1’ [1 mark]   01000000 00110110 00100010 0000001 [1]   1. Compress the following IPv6 address (into the more compact form defined for IPv6 addresses): 47CD:0000:0000:0000:0000:0000:A456:0124 [1 mark]   47CD::A456:0124   1. Explain the reasons for this transition, the advantages it provides and how the transition is being implemented. [10 marks]   Explain the main and other reasons for IPv6, and explain the IETF anticipated transition from the IPv4 n/w to a IPv6 dominated n/w.   1. Detail the different IP exchanges necessary to allow the transition to take place.   [8 marks]  Explain the different exchanges which are needed to implement the transition with description of how each can be achieved. |