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THE NATIONAL UNIVERSITY OF IRELAND, CORK

COLAISTE NA hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE, CORK

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Semester 1 – Winter 2017

CS3506 Networks and Data Communications

Professor Omer Rana
Professor C. J. Sreenan

1.5 Hours

The use of electronic calculators is permitted.
Please clearly label your answer to each question and sub-question.
You should allocate your time for each question in proportion to the marks available, e.g. one minute per mark as a guide.

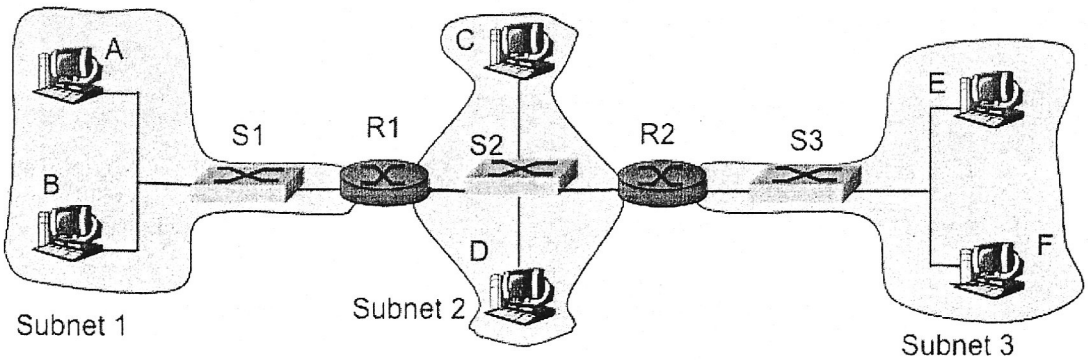
Answer all Questions.
Total Marks 80

PLEASE DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO

PLEASE ENSURE THAT YOU HAVE THE CORRECT EXAM PAPER

Question 1 [30 marks]

Examine the network shown in the diagram below and then answer the questions that follow. Note that R1 and R2 are routers while S1, S2 and S3 are switches.



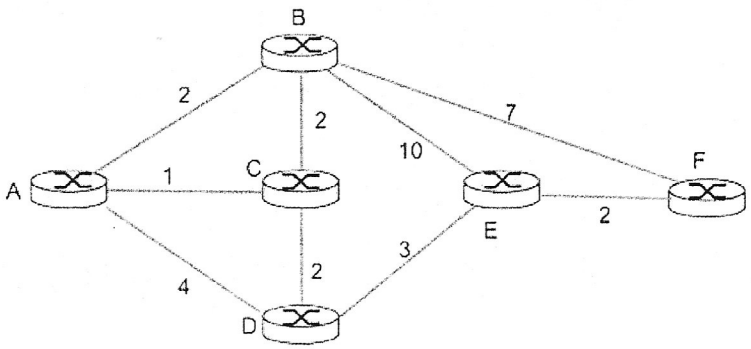
a) Copy the diagram into your answer book and assign IP addresses to each relevant interface; you can use any syntactically correct IP network prefixes. Also assign a MAC address to each interface; for simplicity you can just use 4-digit integers rather than full-length MAC addresses. Please ensure that you draw a large version of the diagram so as to allow sufficient space to legibly write the addresses. *[12 marks]*

b) Consider sending an IP packet from host A to host F. Assume that all of the ARP tables are up-to-date. Explain *all* the steps that are involved, taking care to detail any changes in addresses that occur in transit. *[12 marks]*

c) Reconsider (b) but this time assume that host A has just been connected to the network and its ARP table is empty. What additional actions happen at A and switch S1? *[6 marks]*

Question 2 [24 marks]

a) For the network of routers shown in the diagram below, you are asked to demonstrate your knowledge of the distance-vector algorithm.



For guidance, the initial forwarding table at router E is as follows:

Destination	Cost	Next Hop
A	∞	--
B	10	B
C	∞	--
D	3	D
F	2	F

i. Show the initial forwarding table at router C. *[2 marks]*

ii. Show the forwarding table at router C after *one* iteration of the distance vector algorithm. *[4 marks]*

iii. Show the forwarding table at router C after *two* iterations of the distance vector algorithm. *[4 marks]*

iv. Give the name of a popular distance-vector routing protocol in use today. *[2 marks]*

b) Explain how a popular routing protocol requires the use of broadcast message delivery. *[2 marks]*
Source duplication is one simple mechanism to enable broadcast delivery. What are the drawbacks of this approach? *[4 marks]*
Suggest *one* alternative approach, making sure to explain its operation, and pros/cons. *[6 marks]*

Question 3 [26 marks]

a) In regard to medium access control, what does Carrier Sense mean? *[2 marks]*
Explain how a collision can occur in a classic Ethernet network, despite the use of Carrier Sense. *[3 marks]*
Briefly explain the manner in which a transmitting node in a classic Ethernet network, having detected a collision, decides on when to attempt to retransmit. *[5 marks]*
Under what circumstances does Carrier Sense fail in 802.11? *[2 marks]*

b) Explain the objective of IPSec. *[4 marks]*
What is the difference between the ESP and AH protocols? *[2 marks]*
What is a VPN? *[2 marks]*
Using a diagram, show how IPSec can be used to implement a VPN for a typical company scenario. *[6 marks]*