

UNIVERSITY OF ABERDEEN SAMPLE-3Q

EG4546

Degree Examination in Communications Engineering II**PLEASE NOTE THE FOLLOWING**

- (i) You **must not** have in your possession any material other than that expressly permitted in the rules appropriate to this examination. Where this is permitted, such material **must not** be amended, annotated or modified in any way.
- (ii) You **must not** have in your possession any material that could be determined as giving you an advantage in the examination.
- (iii) You **must not** attempt to communicate with any candidate during the exam, either orally or by passing written material, or by showing material to another candidate, nor must you attempt to view another candidate's work.
- (iv) You **must not** take to your examination desk any electronic devices such as mobile phones or other "smart" devices. The only exception to this rule is an approved calculator.

Failure to comply with the above will be regarded as cheating and may lead to disciplinary action as indicated in the Academic Quality Handbook.

Notes: (i) Candidates ARE permitted to use an approved calculator

(ii) Candidates ARE NOT permitted to use Engineering Mathematics Handbook

(iii) Candidates ARE NOT permitted to use GREEN or RED pen in their exam booklet.

(iv) Data sheets are attached to the paper (Protocol Header Sheet).

Attempts ALL questions

Each question is worth 20 marks/Total marks 60.

1. (a) Explain the method by which a number of systems may share a common media cable and provide random access to send frames of data to each other. [10 marks]
- (b) Explain what is mean by the terms “*Broadcast Domain*” and “*Collision Domain*” [4 marks]
- (c) Sketch an Ethernet frame and explain the function of the bytes that precede the first byte of the Layer 2 address. [6 marks]

2. (a) In the context of *Fast Ethernet* explain how the following sequence of bits {1 0 0 1 1 0 } are encoded using *Multi-Level Threshold*, MLT-3 line encoding. [8 marks]
- (b) Provide a description of how a *Network Interface Card* (NIC) processes the addresses in a frame received. [8 marks]
- (c) What is *promiscuous mode*? Provide two examples of when this is useful. [4 marks]

3. (a) Explain the operation of the *IP Address Resolution Protocol* (ARP). [8 marks]
- (b) Why is a *cache* used at the ARP requester? [2 marks]
- (c) Provide diagrams and a detailed explanation on **either** of the two following topics:

Explain the operation of a Domain Name System (DNS) resolver

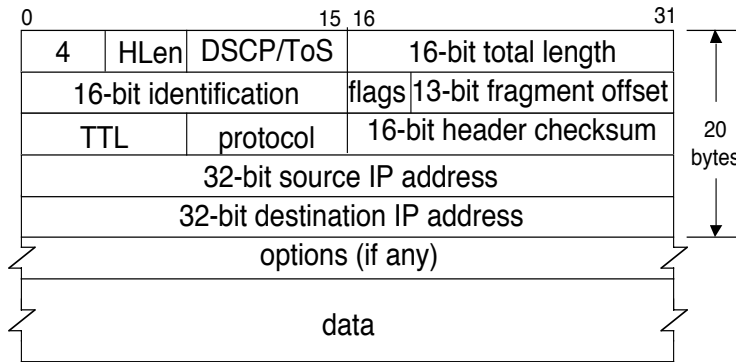
or

How can an IP network node automatically determine IP network address that it should use on a specific LAN segment?

[10 marks]

End of paper

PDU Header Chart



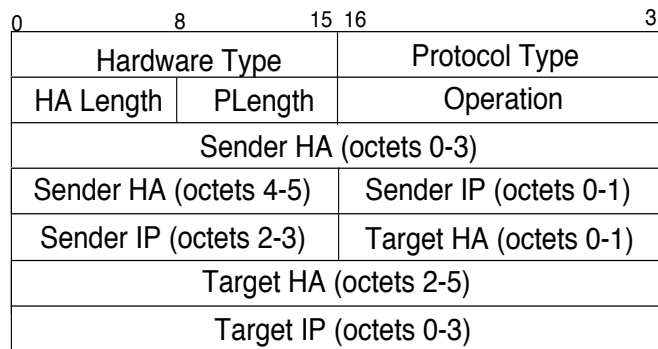
IP Protocol Types

- 0 IP
- 1 ICMP
- 2 IGMP
- 6 TCP
- 17 UDP

IPv4 Flags

- X More
- X - Don't Fragment
- X -- Unused

Internet Protocol Datagram (Ethernet Type = 0x800)



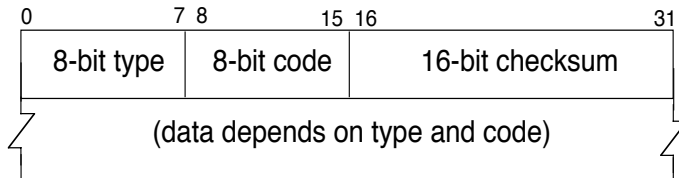
IPv4 DSCP/ToS

- XXXXXX -- DSCP Value
- 0 0 Discard in congestion
- 0 1 ECN enabled (A)
- 1 0 ECN enabled (B)
- 1 1 Congestion indication

Operation ARP Message

- 1 ARP request
- 2 ARP reply
- 3 RARP request
- 4 RARP reply

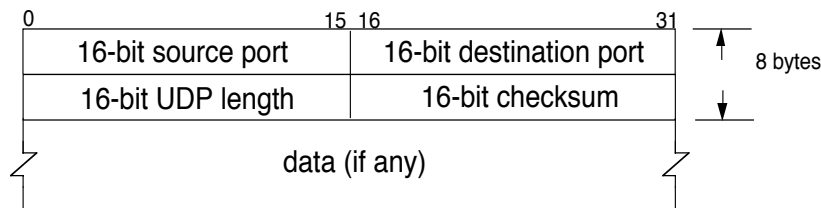
ARP / RARP Packet (Ethernet Type =0x806)



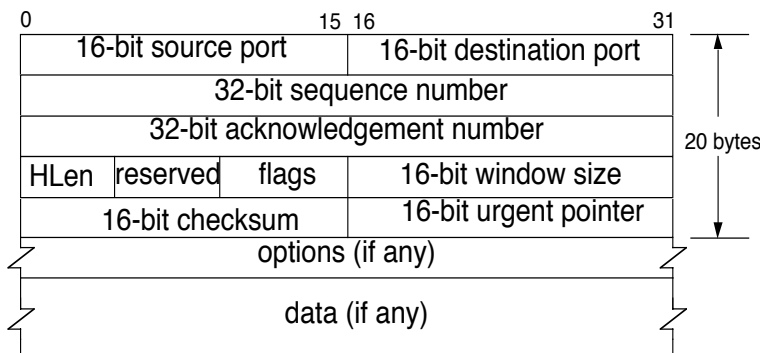
ICMP Message

ICMP Message

- Type
- 0 Echo reply
 - 3 Destination unreachable (also used by PMTUD)
 - 4 Source quench
 - 5 Redirect
 - 8 Echo request



UDP Packet



TCP Packet

Well-Known TCP/UDP Server Ports

Port (decimal)	Service
23	Telnet
25	Mail
69	TFTP
80	WWW (http)