Assumptions:

1. Seven subnets, labelled A to F
2. All subnets use switched Ethernet
3. Six IP routers, labelled R1 to R6
4. Every subnet contains multiple hosts (Hosts H1 and H2 are the only two drawn; assume there are others as well)
5. Routers have numbered interfaces, e.g. R2 has interface 0 on subnet A and interface 1 on subnet B
6. Assume the interface number of each host is 0.
7. Interfaces have hardware addresses assigned (see table on next page)
8. R1 is also connect to multiple other subnet, i.e. the rest of the Internet
9. Subnets A, B, and E are assigned separate /16 addresses
10. Subnets C and D are assigned separate /24 addresses
11. Subnets F and G are assigned /22 addresses within the address space of E

Tasks:

1. Assign network addresses to each of the subnets, also listing the corresponding directed broadcast address
2. Assign IP addresses to the interfaces of the routers and hosts
3. Complete the routing tables of R2, R3, R4, R5, H1 and H2
4. Draw the packet formats for the different scenarios, filling in the relevant header fields

Answers
- Some possible answers are included. You could have chosen different values in some cases.

Subnet	Mask	Network Address	Directed Broadcast
A	/16	1.1.0.0	1.1.255.255
B	/16	2.2.0.0	2.2.255.255
C	/24	4.4.1.0	4.4.1.255
D	/24	4.4.2.0	4.4.2.255
E	/16	3.3.0.0	3.3.255.255
F	/22	3.3.28.0	3.3.31.255
G	/22	3.3.16.0	3.3.19.255

Device	If	HW	IP
R1	1	f1:e2:d3:c4:b5:a6	2.2.1.5
R2	0	12:34:56:aa:bb:cc	1.1.1.1
R2	1	34:56:78:bb:cc:dd	2.2.1.1
R3	0	56:78:90:cc:dd:ee	2.2.1.2
R3	1	a1:b2:c3:d4:e5:f6	4.4.1.10
R3	2	9a:8b:7c:6d:5e:4f	4.4.2.20
R4	0	12:34:56:01:23:45	2.2.1.3
R4	1	12:34:56:99:88:77	3.3.1.1
R5	0	11:22:33:44:55:66	3.3.1.2
R5	1	aa:bb:cc:dd:ee:ff	3.3.28.1
R6	0	99:88:77:66:55:44	3.3.1.3
R6	1	a1:b2:c3:01:23:34	3.3.17.4
H1	0	f4:f5:f6:65:43:21	1.1.1.27
H2	0	a9:a8:a7:b1:b2:b3	4.4.1.156

Router	R2	Router	R3
Destination	Next Router	Destination	Next Router
1.1.0.0/16	direct	2.2.0.0/16	direct
2.2.0.0/16	direct	4.4.1.0/24	direct
4.4.1.0/24	2.2.1.2	4.4.2.0/24	direct
4.4.2.0/24	2.2.1.2	1.1.0.0/16	2.2.1.1
3.3.0.0/16	2.2.1.3	3.3.0.0/16	2.2.1.3
*	2.2.1.5	*	2.2.1.5

Router	R4	Router	R5
Destination	Next Router	Destination	Next Router
2.2.0.0/16	direct	3.3.28.0/22	direct
3.3.0.0/16	direct	3.3.0.0/16	direct
3.3.28.0/22	3.3.1.2	3.3.16.0/22	3.3.1.3
3.3.16.0/22	3.3.1.3	*	3.3.1.1
4.4.1.0/24	2.2.1.2		
4.4.2.0/24	2.2.1.2		
1.1.0.0/16	2.2.1.1		
*	2.2.1.5		

Host	H1	Host	H2
Destination	Next Router	Destination	Next Router
1.1.0.0/16	direct	4.4.1.0/24	direct
*	1.1.1.2	*	4.4.1.10

Web browser on H1 sends HTTP GET request to web server on host H2:

Packet sent by H1:

Ethernet	IP	TCP	HTTP

Src: f4:f5:f6:65:43:21	Src: 1.1.2.7	Src: 50123	
Dst: 12:34:56:aa:bb:cc	Dst: 4.4.1.156	Dst: 80	
Type: 8	Protocol: 6		

Packet received by H2:

Ethernet	IP	TCP	HTTP

Src: a1:b2:c3:d4:e5:f6	Src: 1.1.2.7	Src: 50123	
Dst: a9:a8:a7:b1:b2:b3	Dst: 4.4.1.156	Dst: 80	
Type: 8	Protocol: 6		

DHCP client on H1 sends DHCP discover message (e.g. when host boots):

Packet sent by H1:

Ethernet	IP	UDP	DHCP

Src: f4:f5:f6:65:43:21	Src: 0.0.0.0	Src: 68	
Dst: ff:ff:ff:ff:ff:ff	Dst: 255.255.255.255	Dst: 67	
Type: 8	Protocol: 17		

Ping on H1 sends message to all hosts on subnet F:

Packet sent by 2nd router:

Ethernet	IP	ICMP

Src: 12:34:56:99:88:77	Src: 1.1.1.27	
Dst: 11:22:33:44:55:66	Dst: 3.3.31.255	
Type: 8	Protocol: 1	