EE5132 – Wireless and Sensor Networks
Part 1: Tutorial 3 – Answers

1. Number of link connections = 100 x 4 = 400.
   As each link is connected to two nodes, the number of links 400÷2 = 200.

2(a) Using Dijkstra algorithm:

Iteration	*T*	*L*(2)	Path	*L*(3)	Path	*L*(4)	Path	*L*(5)	Path	*L*(6)	Path	*L*(7)	Path
1	{1}	3	1-2	2	1-3	4	1-4	∞	-	∞	-	∞	-
2	{1,3}	3	1-2	2	1-3	4	1-4	5	1-3-5	∞	-	∞	-
3	{1,2,3}	3	1-2	2	1-3	4	1-4	5	1-3-5	∞	-	∞	-
4	{1,2,3,4}	3	1-2	2	1-3	4	1-4	5	1-3-5	∞	-	∞	-
5	{1,2,3,4,5}	3	1-2	2	1-3	4	1-4	5	1-3-5	11	1-3-5-6	12	1-3-5-7
6	{1,2,3,4,5,6}	3	1-2	2	1-3	4	1-4	5	1-3-5	11	1-3-5-6	12	1-3-5-7
7	{1,2,3,4,5,6,7}	3	1-2	2	1-3	4	1-4	5	1-3-5	11	1-3-5-6	12	1-3-5-7

2(b) Using Bellman-Ford algorithm:

h	*L*(2)	Path	*L*(3)	Path	*L*(4)	Path	*L*(5)	Path	*L*(6)	Path	*L*(7)	Path
0	∞	-	∞	-	∞	-	∞	-	∞	-	∞	-
1	3	1-2	2	1-3	4	1-4	∞	-	∞	-	∞	-
2	3	1-2	2	1-3	4	1-4	5	1-3-5	∞	-	∞	-
3	3	1-2	2	1-3	4	1-4	5	1-3-5	11	1-3-5-6	12	1-3-5-7
4	3	1-2	2	1-3	4	1-4	5	1-3-5	11	1-3-5-6	12	1-3-5-7

3. (a) By using DSR algorithm to create a route from nodes 6 to 23, node 6 at first checks its route cache to determine whether it already has a route to the destination 23, if it has, it will use this route. If it does not have such a route, it initiates route discovery by broadcasting a route request packet. This route request contains the address of node 23. A reply is generated when the route request reaches either node 23, or an intermediate node whose route cache contains an unexpired route to the destination.

   (b) For AODV, node 6 broadcasts a route request packet (RREQ) to its neighbours, which then forwards the request to their neighbours, and so on, until either node 23 or a node with a fresh enough route to node 23 is located. The main difference between the DSR and AODV is that DSR uses source routing and AODV uses forwarding tables at each node. During the process of forwarding the RREQ, nodes record in their route tables the address of the neighbour from which the first copy of the broadcast packet is received, thereby establishing a reverse path.

4. ZRP combines intra-zone and inter-zone routing. It defines a zone of distance *d* such that nodes within the zone use pro-active routing by maintaining state information for links between them, and inter-zone routing uses a route discovery protocol for determining routes beyond the existing zone. Route discovery is similar to DSR with the exception that route requests are propagated via *peripheral nodes*.

   Peripheral nodes lie at the boundary between two or more zones and they act as intermediate nodes between zones and relay packets across zones.