Artificial Intelligence

Question No. 1

a)	One mark for each correct line from technique to description	**4**
b)	Any **two** categories from (max 4): **One** mark for category and **one** mark for description Supervised learning … [1] … using known tasks with given outcomes to enable a computer program to improve its performance in accomplishing similar tasks [1] Unsupervised learning … [1] … using a large number of tasks with unknown outcomes to enable a computer program to improve its performance in accomplishing similar tasks [1] Reinforcement learning … [1] … using a large number of tasks with unknown outcomes and the use of feedback to enable a computer program to improve its performance in accomplishing similar tasks [1]	**4**

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Question No. 2

a)	Working **(Max 3)** May be seen on diagram • Initialisation: setting Base to 0 • … and the rest of the towns to ∞ • Evidence to show values at nodes being updated • Evidence to show 'visited node(s)' May be seen in working section of paper • Evidence to show calculation of at least one route • Evidence to show more than one route has been calculated for at least one town **Correct Answer (Max 2)** **One mark** for four correct values… … **One mark** for all values correct		**5**

Town 1	Town 2	Town 3	Town 4	Town 5	Town 6
3	5	2	9	3	8

b)	**One** mark for each correct marking point **(Max 3)** • Artificial Neural Networks can be represented using graphs • Graphs provide structures for relationships // graphs provide relationships between nodes • AI problems can be defined/solved as finding a path in a graph • Graphs may be analysed/ingested by a range of algorithms • …e.g. A* / Dijksta's algorithm • …used in machine learning. • Example of method e.g. Back propagation of errors / regression methods	**3**

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Question No. 3

a) i)	**One** mark for correct statement **(Max 1)** • Enables deep learning to take place • Where the problem you are trying to solve has a higher level of complexity it requires more layers to solve • To enable the neural network to learn and make decisions on its own • To improve the accuracy of the result.	**5**	
a) ii)	**One** mark for each correct marking point **(Max 4)** • Artificial neural networks are intended to replicate the way human brains work • Weights / values are assigned for each connection between nodes • The data are input at the input layer and are passed into the system • They are analysed at each subsequent (hidden) layer where characteristics are extracted / outputs are calculated • … this process of training / learning is repeated many times to achieve optimum outputs // reinforcement learning takes place • Decisions can be made without being specifically programmed • The deep learning net will have created complex feature detectors • The output layer provides the results • Back propagation (of errors) will be used to correct any errors that have been made.	**3** **5**	

b)

One mark for each correct calculation as follows **(Max 4)**

- Node B (from Home) (Line 3 in table)
- Node C (from Home) (Line 4 in table)
- Node B and Node E (from A) (Lines 5 and 6 in table)
- Node F and Node School (from E) (Lines 7 and 8 in table)
- Node School (from F) (Line 9 in table)

One mark for correct path **(Max 1)**:
- Home ⇨ A ⇨ E ⇨ F ⇨ School

	Node	Cost from Home Node (g)	Heuristic (h)	Total (f = g + h)
1	*Home*	*0*	*14*	*14*
2	*A*	*1*	*10*	*11*
3	B	5	7	12
4	C	4	9	13
5	B	1 + 3 = 4	7	11
6	E	1 + 6 = 7	3	10
7	F	7 + 1 = 8	3	11
8	School	7 + 5 = 12	0	12
9	School	8 + 3 = 11	0	11

Final Path	Home ⇨ A ⇨ E ⇨ F ⇨ School