Full Chapter Worksheet – Chapter 6
ANSWERS

March 2023

6(b) Robotics is a branch of computer science that deals with design, construction, programming and operations of robots.

6(d)(i)	Any **three** from: e.g. • Collects data • Stores rules for using the data • The ability to reason • The ability to learn // uses machine learning • … by adapting what it does • … for example, from mistakes to not make them again // result from previous decisions impacts future • … by changing its own rules • …by changing its own data • …by being trained • Makes one or more predictions (to make a decision) • Find/analyse patterns	**3**
6(d)(ii)	**Four** from: e.g. • Use **machine learning** algorithms • Collects data about where it has been • Collect data about obstacles/problems • Store successful actions • Stores unsuccessful actions • Identify/store patterns • … to make sure it does not repeat the same incorrect route • … so, it knows how to react to obstacles next time • …so, it knows what is most likely to work next time	**4**

June 2023

Question	Answer	Marks
9(a)	Any **two** from: • It has a **mechanical** structure/framework • It has **electrical** components // by example	2
9(b)	Any **two** from: e.g. • Employees don't need to lift heavy furniture • Employees can be protected from dangerous tasks • Employees can utilise their skills in other tasks • Employees don't need to perform repetitive/mundane tasks	2

Question	Answer	Marks
9(c)	Any **one** from: e.g. • Expensive to **install/purchase/setup** • High ongoing costs/maintenance costs • May deskill the workforce • If they malfunction, production may stop	1

June 2023 (2)

Question	Answer	Marks
9(a)	**Three** from: • Rule base • Knowledge base • Interface	3
9(b)	Any **two** from: • It makes decisions • … by **applying** the rules/logic to the facts/knowledge … • … to provide a result/diagnosis	2

June 2023 (3)

7(b)	Any **two** from: • **Stores** the rules for the system • … for the inference engine to use • Used to link the facts in the knowledge base	2

November 2023 (3)

Question	Answer	Marks
10(a)	Any **one** from: – The ability to learn/adapt // machine learning abilities – The collection of data and the rules for using that data – The ability to reason // has problem solving abilities // makes predictions – Simulates intelligent/human behaviour – Analyses patterns	1

10(b) - User provides input via the User Interface**.**

- It has a knowledge base which Stores all facts, rules, and domain knowledge needed for decision-making.
- It has a rule base which contains rules that guide decision-making
- The Inference Engine checks the Knowledge Base and Rules Base.
- It applies logical reasoning to process the information.
- The system generates an output (solution, recommendation, or diagnosis).

Question	Answer	Marks
11(a)	– Amount of liquid/gas/steam flowing/moving through an environment	1
11(b)	**Two** from (for benefit and matching description) e.g.: – Increases safety – …meaning that workers do not need to go into dangerous areas to collect data/make checks/do dangerous tasks – Can increase jobs/skills – …as employees are needed to learn/maintain the equipment – No need to do repetitive tasks – … so, they can use their time on other/more skilled tasks	2
11(c)	**Two** from (for drawback and matching description) e.g.: – High **set-up/installation** costs – … it would mean the company need to find a lot of money up front to pay for the equipment // employees will need training – Utility/maintenance/repair costs – … increase in bills such as electricity // skilled employees will be required to maintain the system // equipment will break/need updating – Deskilling of the workforce – … may mean that workers will no longer have the skills for some of the manufacturing jobs, should the equipment break	2

November 2023 (3)

Question	Answer	Marks
10(a)	**One** mark for each correct term, in the correct order: – Knowledge base – Inference engine – Rule base // knowledge base – Knowledge base // rule base – Interface	**5**

Question	Answer	Marks
10(b)	Any **four** from: e.g. – It is a form of artificial intelligence – Means it can adapt/change (its own processes) // It can edit its own algorithms – It can edit its own data – It can be trained – … this can be supervised/unsupervised – … meaning it can learn with/without human interaction – Analyses patterns and stores **successful/unsuccessful** results … – … to influence future decisions – (Supervised) means a user tells the system the input and output – (Unsupervised) means the system is given the input and needs to work out the output	**4**

June 2024 (11)

Question	Answer
8(a)	The robot can perform actions **without human intervention**
8(d)	Any **two** from: Example: • The robot is more accurate when planting seeds • The robot does not need to take breaks // works 24/7 • The robot will not get bored of performing a repetitive task • The farmer can perform other tasks whilst the robot is planting the seeds • The robot may be faster/more efficient (at planting seeds) • Safer as the robot can work in a more dangerous environments (e.g. with animals in a field) • Doesn't need to pay **labour** costs/**wages**

8(e)	Any **two** from: Example: • The robot may have been expensive to **purchase** • The robot may need **maintenance** and this may be costly • The robot may take away jobs from humans that previously planted the seeds • Farmer/workers may be deskilled • Farmer may need training in how to use the robot • If it breaks the farmer will need to manually plant • If faulty it may cause damage to farm/seeds • Cannot adapt to a **new/unexpected** event
8(f)	Any **two** from: Example: • The robot can now **adapt itself** by changing its own **rules/data/ processes** • The robot will become more efficient • … as it has a **greater knowledge** of its **surroundings/environment** • … as it can remember where a fence is • … as it can remember the route it needs to take • … as it can remember where any obstacles are to avoid • … as it can remember where to start and stop sowing seeds • … as it may make fewer errors

June 2024 (12)

Question	Answer
10(a)	Any **two** from: • The **simulation** of intelligent behaviours by computers • A collection of data and the rules for using that data • Has the ability to reason • Has the ability to learn/adapt
10(b)	Any **five** from: • The user will enter data into the **interface** // The user will plug the car into an **interface** // The user is given questions using the **interface** • The **inference engine** will decide which questions to ask • … by using the previous answers given • The **inference engine** will decide on a diagnosis • … by **comparing the data/answers** entered to the **knowledge base** and **rule base** • … by calculating which option is most likely if there are multiple • The **interface** will output the **diagnosis/result** • The **explanation system** shows **how** the diagnosis was reached

November 2024 (11)

9(a)	**One** mark for each correct term in the correct order. • artificial • interface • inference engine • knowledge base • rule base • inference engine • interface
9(b)	Machine learning

November 2024 (12)

8(a)	A
8(b)	• Knowledge base • Rule base • Inference engine
8(c)	Any **three** from: For example: • It could **gather data** during **vacuuming** • … and adapt its **own processes** • … such as where obstacles are placed in the room • … such as where dirtier areas are • … such as a path through a room • … such as the shape of a room • … such as the most efficient route to vacuum a room • … so, it knows areas to avoid/concentrate on/use different cleaning tools

November 2024 (13)

5(a)	(A system) that can perform actions **without human intervention**
5(b)	• It receives data from the sensor • It **analyses** the data // It checks if the data is within/out of a range // • It sends **signals** to trigger actions based on the data

5(c)	**Any two** from: For example: • It stops the farmer having to handle heavy equipment • It frees the farmer up to do other jobs • It doesn't need to take breaks // Can work 24/7 • It can perform boring repetitive tasks • Can save money on **labour costs** • May be more accurate at ploughing/planting • May be more efficient than the farmer at ploughing
5(d)	Any **four** from: For example: • It could make use of machine learning • It could **gather data** from **ploughing** • … and use this data to **adapt** its **own process** • … so that it will make fewer mistakes • … such as the dimensions of the field • … such as the landscape of the field • … such as where obstacles are in the field • … to create a map of the field • … to develop the most efficient route to take • … so, it knows what to **avoid** in future

FM2025/12

(b)	Any three from: e.g. ● Changes its data and rules ● … according to feedback/results ● … for example if a result does not give a suitable response this is recorded ● … next time the result is changed ● Supervised/unsupervised learning ● Use of ranking algorithm to decide which appears first

MJ2025/12

5(a)	**Three** from: • The inference engine is used … • … to **decide** which questions to ask the user … • … based on the **previous** data input. • Symptoms input are located in/compared to knowledge base. • … then applies the rule base to the knowledge base (to decide the diagnosis)
5(b)(i)	Any **two** from: Examples: • Sensors • Microprocessors • Actuators

5(b)(ii)	Any **four** from: Examples: • a doctor doesn't need to **travel** to the hospital to do the surgery. • … so it can be done by any specialist/doctor in the world. • … so it can be done immediately without needing to wait for travel time // reduces the waiting time for the patient. • … so the doctor may be better at the surgery as they won't be tired from travel. • … so travel costs are saved. • Surgery with robots enhances precision/accuracy. • … so a smaller incision can be made. • … so the recovery time may be shorter. • … as the components used to enter the body can be much smaller than a human hand. • … so the surgery is safer/ more hygienic // by example e.g. can stop the doctor needing to be near an infectious patient. • The surgery may have a higher rate of success
5(b)(iii)	**Two** from (one for a point and one for the matching expansion): Examples: • The internet connection could be lost/delayed … • … so the surgery may not be able to continue. • The robot will be expensive to buy/maintain … • … this money could have been spent on other causes. • The robot could be hacked …. • … and endanger the patient's life. • Data could be corrupted in transmission … • … changing the nature of the instruction for the robot. • The robot's hardware could malfunction … • … so the surgery cannot continue

ON2025/13

6(b)	Any **three** from For example: • It could use machine learning • It can collect data about the **players** actions • **Analyse/identify patterns** in the player's movements • … so it can learn how the player moves • … to help predict the next movement of the player • It can adapt its own movements to match the players // It can adapt its own processes • It can store successful/unsuccessful moves • It will learn the most efficient/optimal movements against a player