Ethics And Ownership

Papers Dock

COMPUTER SCIENCE 9618 PAPER 1

Ethics And Ownership

What is Ethics ?

- System of moral principle
- That guides behaviours
- Based on philosophical and religious issues
- Example : Respectful and considerate behaviour.

We have two Ethical bodies, BCS (British Computer Society) and IEEE (Institute of Electrical and Electronic Engineers)

8 IEEE Code of Ethics

Public: Developer must act consistently with the public interest.

Example : Pappo Bhai who is programmer in a software company, ensures that the app he is developing does not compromise user privacy or promote misinformation, keeping the public's best interests in mind.

Client and Employer: Developer must act in the best interest of their client and employer consistent with the public interest.

Example : Pappo Bhai, working on a project ensures that he meets deadlines and delivers accurate, high-quality work, while also advising the client to avoid unethical practices like false advertising.

Product: Software engineers should ensure that their product meets the highest professional standard.

Example : Pappo Bhai, tasked with building an e-commerce platform, thoroughly tests the system for bugs and security vulnerabilities to provide a reliable and professional product to end-users.

Profession: Software engineers shall advance the integrity and reputation of the profession consistent with public interest.

Example : Pappo Bhai volunteers to mentor junior developers in his company, helping them understand ethical coding practices, thus enhancing the integrity of the profession.

Judgment: Software engineers should maintain integrity and independence in their professional judgment.

Example : Pappo Bhai, while reviewing a project proposal, raises concerns about a feature that could potentially harm user security, despite pressure from his team to approve it.

Management: Software engineers managers should promote an ethical approach to the management of software development and maintenance.

Example : Pappo Bhai, after being promoted to a managerial role, implements a code review policy to ensure that all team members follow ethical standards in their software development practices.

Colleagues: Software engineers should be fair and supportive to their colleagues.

Example : Pappo Bhai, while working in a software company, helps a teammate debug their code instead of blaming them for a project delay.

Self: Software engineers shall participate in lifelong learning regarding the practice of their profession.

Example : Pappo Bhai enrolls in an online course to learn the latest advancements in machine learning, ensuring he stays updated and continues improving his skills.

British Computer Society

1) Public Interest

- Members must prioritize the public good and consider the well-being of society.
- They should avoid harm to others and promote the responsible use of IT.

Key Responsibilities

- Respect privacy and confidentiality.
- Ensure IT systems and processes are used in ways that do not harm individuals or society.
- Take action if unethical behavior is observed in the workplace.

Example: Pappo Bhai who is a BCS member avoids implementing a feature in software that could invade users' privacy without their consent.

2) Professional Competence and Integrity

- Members must maintain their professional knowledge, skills, and competence.
- They should ensure honesty in their work and clearly communicate limitations in their expertise.

Key Responsibilities

- Only undertake tasks that you are competent to perform.
- Stay updated on new technologies and practices.
- Avoid conflicts of interest.

Example: Pappo Bhai who is a BCS member refuses to work on a project involving advanced AI if they lack the necessary expertise and recommends someone more qualified.

3) Duty to Relevant Authority

- Members must carry out their responsibilities with due diligence and loyalty to their employers, clients, and stakeholders.
- They should avoid any conflict between personal and professional interests.

Key Responsibilities

- Provide honest advice to employers or clients, even if it conflicts with what they want to hear.
- Act within the law and organizational rules.
- Avoid using IT systems to harm others.

Example: Pappo Bhai who is a BCS member advises their employer against a poorly planned project timeline, even though it might delay the launch, ensuring quality and compliance.

4) Duty to the Profession

- Members must uphold the reputation and dignity of the IT profession.
- They should promote ethical behavior and encourage others to follow the code of conduct.

Key Responsibilities

- Support colleagues and mentor juniors.
- Avoid actions that bring disrepute to the IT profession.
- Report any unethical practices in the workplace.

Example: Pappo Bhai who is a BCS member mentors a junior colleague to ensure they adhere to ethical practices in software development.

How can a developer ensure that he is acting in the best interest of his clients?

- Keeps client's personal data private.
- Involve the client in development.
- Provide the solution that the client asks for.
- Keep the project running on time.
- Keep the client informed.

What a developer can do to feel more confident before joining a new job?

- Read about the language that he/she will be using.
- Visit the office prior to starting.
- Speak to their manager about concerns.

What is ethical action done by a manager to make a new developer feel comfortable?

- Prepare an introduction.
- Invite the developer before starting.
- Introduce the developer to the team.

What is ethical action done by a colleague to make a new developer feel comfortable?

- Prepare a greeting.
- Provide structured support.
- Invite the developer to social events.

Why a professional code of conduct should be signed before starting?

- To confirm that the developer understands the code of conduct.
- To make sure what behavior is expected from the developer.
- To make the developer understand that there may be consequences of some actions.
- To ensure that all employees adhere to the same standard.

Aisha manages a team of software developers.
Explain the reasons why it is important that Aisha acts ethically in relation to her team members ?

- To make sure the team members feel valued
- To get the best work out of the team
- To enable them to work well together
- To enable them to create the best product for the client

Francis is shown the software he will be working on. He is unfamiliar with the Integrated Development Environment (IDE) he is required to use.
Describe the ways in which Francis can act ethically in this situation.

- He can tell the manager he has not used it
- ... and how he will get up-to-date
- He can perform his own research on how to use it
- He can explain to the manager that he needs additional training
- He can ask the manager to book him on a training course
- He can ask for a mentor/to shadow someone
- He can practice at home before starting

Francis has been advised to join a professional ethical body. Describe the benefits to Francis of joining a professional ethical body.

- Francis has ethical guidelines to follow, ensuring clients and other staff understand the standards being applied, and he doesn't need to decide what is ethical as it is already documented.
- Membership enhances Francis's reputation, as clients and staff recognize his skills and knowledge, which may have been tested or vetted during entry.
- Francis gains access to help and support, such as legal advice, whenever needed.
- The professional body provides training courses, helping Francis keep his skills updated and relevant to industry standards.

Francis is part of a team writing a program. He finds an error in part of the program that has already been tested. He decides not to tell anyone because he is worried about the consequences.
Explain the reasons why Francis acted unethically in this situation.

- Francis didn’t act in the best interest of the product because the product might fail due to the unreported error.
- Francis didn’t act in the best interest of the client because if the product doesn’t work, the client will be let down by his failure to report the error.
- Francis didn’t act in the best interest of the profession because by not reporting the error, he let his profession down.
- Francis didn’t act in the best interest of the company because not correcting the error early could lead to bigger problems later.

Ownership

What is meant by copyright ?

- The formal and legal rights to ownership
- Protects against unauthorized reproduction of work.
- Provides for legal right of redress, which means the right to ask for help or compensation if someone breaks the rules or violates your rights.

Software Licensing

Commercial Free Software Foundation Shareware Open Source

What is meant by Commercial License ?

- Restricted use
- Source code not provided so can not edit the source code
- Anyone can purchase/download if agree to the terms
- Limited number of installation
- Software key needed to install
- The user must always pay before being able to use the software.
- The user can not re distribute the software.

Benefits of Commercial License to owner ?

- a fee can be charged for the program
- enables the program to be copyrighted
- prevents illegal changes to the program / protects the source code
- prevents illegal copies of the program being made so the software can not be distributed by third party

Benefits of Commercial License to Customer ?

- Potentially better support as fee is paid
- Redress is available if software does not work correctly.
- Likely to have fewer bugs.

What is meant by Opensource License ?

- The source code is released with the program
- User can edit the source code to suit their needs
- User re-release their version under same terms and can redistribute the software.
- Can be cost-free but may also need payment

Explain why some programs are distributed under an open source license ?

- to allow users to customise the code
- to allow errors to be reported / identified / fixed by users
- to allow additional features to be added to the code
- to allow for collaboration

What is meant by Shareware License ?

- User gets a free trial which may be limited in features
- No access to source code
- The user has to pay after expiry date
- The user can redistribute software

Benefits of shareware to customer ?

- They can check if it works
- Without paying fee if it does not

What is meant by Free Software Foundation License ?

- Freeware is software that has no fee and is free to use but does not provide access to the source code, meaning users cannot view, modify, or customize it.
- The software is usually copyrighted, and modification or redistribution is prohibited without permission from the creator.
- Users can only use the software in its original form as provided.

Artificial Intelligence

Artificial intelligence is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans because they require human intelligence.

Impacts Of Artificial Intelligence

Social Economic Environmental

What is Social Impact?

Social impact refers to how a technology, policy, or action affects society, including individuals, communities, and the way people interact. It encompasses both positive and negative changes in areas like safety, privacy, equality, and efficiency.

Social Impacts Of Artificial Intelligence

Positive Impacts

- AI improves efficiency and speeds up processes.
- Safety can be improved through better monitoring and prevention.
- AI increases accessibility for people with disabilities.
- Automation of tasks reduces human workload.

Negative Impacts

- Automation of tasks may lead to job loss.
- Privacy concerns arise due to data collection and surveillance.
- Bias in AI systems can lead to discrimination.
- Ethical concerns emerge about accountability in decision-making.
- Economic disparity may grow between those who can afford AI and those who cannot.

What is Economic Impact?

Economic impact refers to how something affects the financial aspects of a business, community, or individual. This includes changes in costs, profits, jobs, or how money is spent and saved. It can be either positive, like increasing profits or saving costs, or negative, like high expenses or job losses.

Economic Impacts Of Artificial Intelligence

Positive Impacts

- Reduces costs for businesses by automating processes, saving time and labor.
- Increases profits by enabling workers to focus on higher-value tasks.
- Reduces costs for customers, attracting more clients and increasing business.
- Enhances productivity, allowing more jobs or tasks to be completed in less time.

Negative Impacts

- Initial costs of AI systems can be high due to purchase, maintenance, and updates.
- Profit margins may reduce if operational costs for AI systems outweigh benefits.
- Job displacement might increase economic inequality in the workforce.

What is Environmental Impact?

Environmental impact refers to how a technology, action, or activity affects the natural environment. This includes changes to air, water, land, plants, and animals, which can be beneficial or harmful

Environmental Impacts Of Artificial Intelligence

Positive Impacts

- Reduces waste through better resource management.
- Lowers carbon emissions by using energy-efficient technologies.
- Promotes sustainability by encouraging renewable energy use.
- Helps monitor and protect wildlife and ecosystems using AI or IoT tools.

Negative Impacts

- Increases electronic waste due to short device lifecycles.
- Consumes high amounts of energy, leading to more carbon emissions.
- Resource depletion from manufacturing advanced technologies.
- Pollutes the environment if disposal of devices isn't managed properly.

Guide To Answer Scenario Based Question

Step 1: Understand the Scenario
Carefully read and analyze the scenario provided. Focus on:

- What the AI is doing (e.g., diagnosing faults, facial recognition, optimizing systems).
- Where it is being used (e.g., an airport, a garage, a hospital).
- Who it affects (e.g., customers, employees, society at large).

Step 2: Identify the Type of Impact
Determine if the question is asking about social, economic, or environmental impacts.

- Social Impact: Focus on how it changes human interactions, privacy, safety, or community well-being.
- Economic Impact: Consider costs, profits, job creation/loss, or productivity.
- Environmental Impact: Think about how it affects air, water, energy use, or waste.

Step 3: Think Specifically About That AI
Relate the impact to the specific use of AI mentioned in the scenario. For example:

- **For facial recognition, think about issues like privacy, safety, or surveillance.**
- **For diagnostic AI in a garage, focus on time saved, costs reduced, or customer satisfaction.**
- **For AI in logistics, think about energy efficiency, transportation emissions, or resource management.**

Step 4: Address Both Positive and Negative Impacts

- **For a balanced answer, include both benefits and drawbacks if the question doesn't specify only one. Use the marking scheme as a guide to include details.**

Application Of Artificial Intelligence

Describe how the computer would use AI to play the chess board game ?

- The rules, past moves, and decision-making algorithms of the game will be stored.
- The AI program is trained by playing many times.
- AI will look ahead at possible moves.
- And analyze the pattern for past choices.
- And choose the move most likely to be successful.
- Computer could learn how to improve from previous mistakes.
- By storing positive/negative results of choices.
- And changing its future choice.

Describe Application of Artificial Intelligence:?

Police Identifying Wanted People

- Uses image recognition.
- To identify features in an image.

Self-Driving Cars

- Directs its position on the road and within the traffic.
- Follows a route, collision avoidance, and self-parking.

Game Playing

- Models characters in a computer game.
- To allow computer characters to react according to the player's movement.

Explain how the use of AI can help improve the safety and efficiency of a factory ?

- Machines can learn from past problems.
- They can adapt to stop the same problem occurring again.
- They can learn to predict what might happen and raise an alert.
- Machines can learn how to work efficiently.
- When an action slows the system down, it can prevent this from happening again.
- When an action increases the speed of the system, it can repeat this when necessary to improve efficiency.

The mobile telephone uses a built-in digital camera to record the video. The digital camera automatically focuses on the faces of people. Explain how Artificial Intelligence (AI) is used by the camera to automatically focus on the faces of people ?

- Scans the scene in real time
- Identifies if there are faces in the image
- Uses facial recognition
- Uses image recognition
- Takes each frame individually
- Analyzes the pixels
- Stores pattern for a face
- Looks for patterns that match/come close to the pattern for a face
- Camera focuses on the pattern identified

One section of the program being developed will convert user's speech into commands.
Explain how Artificial Intelligence (AI) can be used in this program ?

- Uses speech recognition
- Which identifies key phrases/words spoken
- Matches these to a database
- Generates the most likely sentence/command/word

Guide To Answer Application Question

Common Points to Include

- Data Input: AI receives input, such as speech, images, or actions.
- Processing: AI analyzes the input (e.g., scans images, recognizes words, or looks at past patterns).
- Pattern Matching: AI compares the input to stored patterns or a database.
- Prediction or Action: AI predicts the next step or performs an action (e.g., focusing on an image or generating a command).
- Learning: AI improves over time by learning from past successes and mistakes (e.g., adapting to prevent errors or repeating successful actions).

Use the common points but adapt them to the scenario.

Ethics And Ownership

Question 1

(d) Anya made sure that the image was not subject to any copyright before scanning it.

Describe what is meant by **copyright**.

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Question 2

2 Aisha manages a team of software developers.

(a) Explain the reasons why it is important that Aisha acts ethically in relation to her team members.

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(b) The team are developing a computer game where the user plays a board game (such as chess) against the computer.

Describe how the computer would use Artificial Intelligence (AI) to play the board game.

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(c) The final game will be released under a licence.

Tick (✓) **one or more** boxes in each row to identify the licence(s) each statement describes.

Statement	Free Software Foundation	Open Source Initiative	Shareware	Commercial Software
The user can edit the source code				
The user **must** always pay before being able to use the software				
The user can redistribute the software				
The user always gets a trial period				

[4]

Question 3

4 Francis is starting his first job as a software developer for a multinational company.

(a) Francis has been advised to join a professional ethical body.

Describe the benefits to Francis of joining a professional ethical body.

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(b) Francis is shown the software he will be working on. He is unfamiliar with the Integrated Development Environment (IDE) he is required to use.

(i) Describe the ways in which Francis can act ethically in this situation.

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(c) Francis is part of a team writing a program. He finds an error in part of the program that has already been tested. He decides not to tell anyone because he is worried about the consequences.

Explain the reasons why Francis acted unethically in this situation.

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Question 4

(b) The programmer wants to allow users to edit, improve and redistribute the program.

Identify **two** different types of software licence that the programmer could use.

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Question 5

8 Describe **one** application of Artificial Intelligence (AI).

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Question 6

9 One use of Artificial Intelligence (AI) is for facial recognition software.

Describe the social impact of using facial recognition software to identify individuals in an airport.

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Question 7

8 **(a)** **(i)** Explain why some programs are distributed under an open source licence.

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(ii) Explain how a programmer benefits from distributing a program under a commercial licence.

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(b) A commercial program for a vehicle repair garage includes an Artificial Intelligence (AI) module that can diagnose faults and suggest repairs.

Describe **one** economic impact the AI module may have on the garage.

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Question 8

(c) The CCTV system uses Artificial Intelligence (AI) to identify the presence of a person in the house and to track their movements.

Describe how AI is used in this system.

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Question 9

(d) One section of the program being developed will convert user's speech into commands.

Explain how Artificial Intelligence (AI) can be used in this program.

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Question 10

(b) The mobile telephone uses a built-in digital camera to record the video.

The digital camera automatically focuses on the faces of people.

Explain how Artificial Intelligence (AI) is used by the camera to automatically focus on the faces of people.

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Question 11

(b) The programmer needs to publish the game under a software licence so that it can be sold to the public.

Identify the **most appropriate** type of software licence for the game **and** justify your choice.

Licence .....

Justification .....

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Question 12

6 **(a)** State **two** benefits to a programmer of distributing a program using a shareware licence.

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(b) Explain why it is important for a programmer to join a professional ethical body.

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Question 13

(ii) Customers need to use biometric authentication to access their accounts.
One biometric authentication method is facial recognition.

Facial recognition uses Artificial Intelligence (AI).

Describe how AI is used in facial recognition.

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Question 14

(b) The robot uses Artificial Intelligence (AI) to communicate with the customers. The customers speak to the robot to order their food and drinks.

Explain how AI will be used in this part of the robot.

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Question 15

Sophie is about to start a new job as a junior software developer.

(a) She is worried about joining a new team of people.

(i) State one ethical action that Sophie can take to help her to feel more confident about starting work.

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(ii) State two ethical actions that Sophie's manager can take to help Sophie to feel more confident about starting work.

1 .....

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2 .....

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(iii) State one ethical action that Sophie's new colleagues can take to help Sophie to feel more confident about starting work.

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(b) Explain why Sophie is asked to sign a professional code of conduct before starting work.

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Question 16

Annchi needs to decide which type of software licence to use for the game.

(i) Give two benefits to Annchi of using a commercial licence.

1 .....

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2 .....

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(ii) Give one benefit to the customers of the game being released using a commercial licence.

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(iii) Describe one benefit to the customers of the game being released using a shareware licence.

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Question 17

A software company produces software and distributes it under different software licences.

(a) Four descriptions of software licences are given. Write the type of software licence that best fits each description. Use a different type of licence for each description.

1. The software can be legally used, only after a fee has been paid.

Licence type .....

2. The source code comes with the software. If the software is modified, the edited source code must be released under the same conditions as the original software.

Licence type .....

3. T he software is free for a trial period and then a fee is requested, or expected, if the user wants to continue to use the software.

Licence type .....

4. T he source code comes with the software. The software is free to be downloaded, edited, and distributed, possibly without restriction.

Licence type ..... [4

Question 18

A software developer works in a team for a large software development company.

(a) Two principles of the ACM/IEEE Software Engineering Code of Ethics are:

- developers must act consistently with the public interest
- developers must act in the best interest of their client and employer.

Name and describe three other principles in the ACM/IEEE Software Engineering Code of Ethics.

Principle 1 .....

Description .....

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Principle 2 .....

Description .....

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Principle 3 .....

Description .....

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Question 19

Frankie is a software developer. He is developing a program to manage customer records for a client with an online retail business. He must ensure that data stored about each customer are both secure and private

(d) One principle of the ACM/IEEE Software Engineering Code of Ethics is to always act in the best interest of the client. Explain how Frankie can ensure that he is acting in the best interest of his client. .....

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Question 20

Mica has created some software and has copyrighted it. She wants to stop other people from copying and changing it illegally.

(a) Identify two ways Mica can prevent illegal copies of the software being installed.

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2 .....

..... [2]

(b) Identify one way Mica can distribute the software without the source code.

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(c) Mica is releasing the software under a commercial licence.

(i) Give two benefits to Mica of using a commercial licence.

1 .....

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2 .....

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(ii) Name two other types of software licence.

1 .....

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2 .....

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Question 21

Hugo has produced a program (app) for mobile phones. He needs to decide whether to use an Open Source licence or to distribute the app as shareware. (a) Describe what is meant by Open Source licence and shareware.

Open Source .....

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Shareware .....

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(b) Tick (✓) **one** box to indicate the licence Hugo should use. Justify your choice.

Open Source	
Shareware	

Justification .....

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Question 22

For each of the following scenarios, tick one box for each scenario to indicate whether you think the person's behaviour is ethical or unethical. Justify your choice.

(a) Kevin is a software engineer who has recently started a job with a new company. He is using program code from his previous employer in his new employer's programs

Ethical	
Unethical	

Justification

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(b) Nadya is a software developer. She has accepted a new job. She has never worked with the programming languages used by this new company. Nadya is planning to increase her knowledge of these programming languages before she starts her new job.

Ethical	
Unethical	

Justification .....

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(c) Maria finds that one of her team members has produced some inventive code. She presents this to her manager, stating that it was produced by the team. She does not mention the individual's name.

Ethical	
Unethical	

Justification .....

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Question 23

This question presents three scenarios. For each scenario, tick (✓) one box to show whether you think the person's behaviour is ethical or unethical. Justify your choice.

(a) Wendy is a software engineer who is developing a program for her company. Her friend, Noah, is developing a program for a different company. Wendy looks at the code that Noah is writing to get ideas for her own program.

Ethical	
Unethical	

Justification .....

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(b) Amit is fixing some bugs in the computer system of a large multinational company. He is asked to sign a confidentiality agreement. He sees some confidential information which contains the names of other multinational companies that have broken the law. He copies this information and releases it on the Internet.

Ethical	
Unethical	

Justification .....

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(c) Farah is providing a company with an estimate for the cost of writing a program. The company she works for is in financial difficulty so she increases the estimate by 10%.

Ethical	
Unethical	

Justification .....

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Question 24

This question presents three scenarios. Tick (✓) one box for each scenario to indicate whether you think the person's behaviour is ethical or unethical. Justify your choice.

a) Mason is using his work computer to book a holiday whilst at work

Ethical	
Unethical	

Justification .....

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(b) Ethan is supervising a trainee. The trainee asks Ethan for a reference for another job. Ethan does not want to lose the trainee, so refuses to give him a reference.

Ethical	
Unethical	

Justification .....

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(c) Margarita finds that one of her team members has produced some inventive code. She presents this to her manager, praising the individual by name

Ethical	
Unethical	

Justification .....

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Question 25

5 Arnold is a software developer. He has created a computer game for people to download over the Internet. Arnold is considering releasing the game as a piece of commercial software.

(a) (i) Describe what is meant by a commercial licence.

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(ii) Name and describe one other type of licence that Arnold can consider using.

Licence type .....

Description .....

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(b) Users need to enter their name and email address to create an account. The information is stored in a database on Arnold's computer. Give three ways that Arnold can ensure users' details are kept secure.

1 .....

2 .....

3 ..... [3

Question 26

Raj has joined a software company as a trainee programmer. He was given the company's Code of Conduct document during his induction training. The handbook has a section headed 'Ethical Behaviour'.

(a) Describe what is meant by ethics.

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(b) Raj is assigned to work as a new member of a development team. In his first week, Raj feels uncomfortable working with one of his colleagues. He is unfamiliar with the programming language used by the team. Next week, he will be working on the site of one of the company's clients with a colleague. Raj is very nervous about working in an unfamiliar workplace. Raj has a review with his manager after his first three weeks.

The Code of Conduct document was produced by the Human Resources section. It closely follows the ACM/IEEE Software Engineering Code of Ethics that uses these eight key principles:

Public	**Client and Employer**	**Product**	**Judgement**
Management	**Profession**	**Colleagues**	**Self**

There are issues Raj will want to raise with his manager.

- Describe two of these issues.
- Circle the key ACM/IEEE principle this comes under.
- Suggest what action should be taken to demonstrate ethical behaviour.

Issue 1

Description .....

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ACM/IEEE principle (Circle one only)

Public	**Client and Employer**	**Product**	**Judgement**
Management	**Profession**	**Colleagues**	**Self**

Possible action .....

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Issue 2

Description .....

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ACM/IEEE principle (Circle one only)

Public	**Client and Employer**	**Product**	**Judgement**
Management	**Profession**	**Colleagues**	**Self**

Possible action .....

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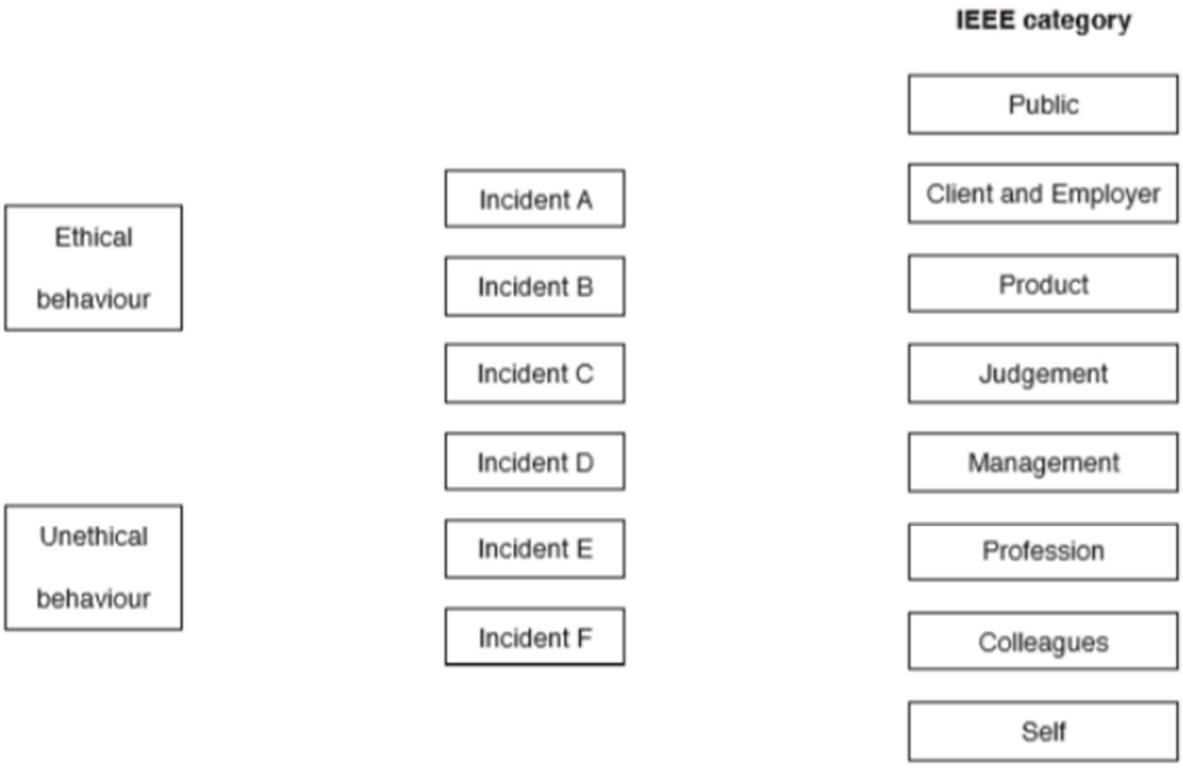
Question 27

5 The IEEE Software Engineering Code of Ethics uses eight key principles shown in the right-hand column of the following diagram.

Tom is employed as a tester with a software company. He is keen to become a trainee programmer.

The middle column in the diagram labels six incidents which have happened to Tom this week. The table that follows the diagram describes each incident.



Incident	Description
A	Tom has received some phishing emails. He reported this to the bank they were supposed to have come from.
B	Tom has asked his manager if they will pay for him to attend a programming course.
C	Tom is testing beta versions of new games software at work. He copies the software on to CD-Rs and sells them to his friends.
D	Tom has completed the application forms to join the Chartered Institute for IT.
E	Tom finds it difficult to work with one of his colleagues. His way of dealing with this has been to refuse to speak with the colleague.
F	Tom's manager had considered the testing of a new game was completed. Tom reported to his manager that he thought there were still bugs which needed to be rectified.

(a) Draw a line on the diagram to link each of the six incidents to either ethical behaviour or unethical behaviour. [2]

(b) Consider each incident you have identified as **ethical behaviour**.

Draw a line from each incident to indicate the IEEE category it maps to. [4]

Question 28

5 Three types of software licensing and four descriptions are shown in the table below.

Put a tick (✓) in each row to match each description to the appropriate type of software licensing.

	Type of software		
Description	**Open source**	**Shareware**	**Commercial**
Software is purchased before it can be used			
Source code comes with the software			
Software is provided free on a trial basis			
The software can be modified by the user			

[4]

Question 29

A team of software engineers is developing a new e-commerce program for a client.

State three of the principles of the ACM/IEEE Software Engineering Code of Ethics. Illustrate each one, with an example, describing how it will influence their working practices.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

3 .....

.....

.....

.....[6]

Question 30

A company needs new software to manage its accounts. It is evaluating two different options. One option is open source software and the other is commercial software.

(a) Explain what is meant by open source software.

.....

.....

.....

.....[2]

(b) Explain what is meant by commercial software.

.....

.....

.....[2]

(c) The company has decided to purchase commercial software.

Identify four benefits to the company in choosing the commercial software option.

1 .....

.....

2 .....

.....

3 .....

.....

4 .....

.....[4]

Question 31

Paul works part-time for a large software company. The company sells security software to a number of banks. He also runs his own software company that produces and sells computer games.

Six statements about computer ethics are shown below.

Draw lines to indicate whether each statement describes ethical or unethical behaviour.

Statement	
To save time, Paul fakes the test results when testing the bank security software.	
Paul uses the software developed in his day job to help write some of the games software routines.	Ethical
To allow him to concentrate on his games software, Paul has frequently turned down job opportunities in his day job.	
To make the games software more realistic, Paul uses password protection code used in the bank security software.	Unethical
Because his work load is increasing, Paul is now using overseas companies to write some of the routines used in his games software.	
Paul carries out training on how to write games software in his spare time.	

[6]

Question 32

5 Bobby is a senior programmer at a software house which produces intruder detection software. He also runs his own software company which develops and sells various computer applications.

The following table shows seven activities which Bobby carries out.

Put a tick (✓) in the appropriate column to identify if the activity is ethical or unethical.

Activity	Ethical	Unethical
gives away passwords used in the intruder detection software		
uses source code developed at the software house for the software he develops for his own company		
insists that staff work to deadlines		
turns down training opportunities offered by his employer		
writes and sells software that reads confidential data from client computers		
fakes test results of safety-critical software		
has the software applications developed overseas for sale in his own country		

[7]

Answer

Answer 1

1(d)	**1 mark** per bullet point to **max 2** • The **formal and legal rights** to ownership // intellectual property rights • Protects against **unauthorised** reproduction of work • Provides for legal right of redress	**2**

Answer 2

2(a)	**1 mark** per bullet point to **max 2** • To make sure the team members feel valued • To get the best work out of the team • To enable them to work well together • To enable them to create the best product for the client	**2**
2(b)	**1 mark** per bullet point to **max 3** • The rules / past moves / decision making algorithms of the game will be stored • The AI program is trained, by playing many times • AI will look (ahead) at possible moves • ... and/or analyse the pattern of past choices • … and choose the move most likely to be successful • Computer could learn how to improve // learn from previous mistakes • … by storing the positive/negative result of choices • ... and changing its future choices	**3**

2(c)	**1 mark** for each correct column	**4**

Statement	Free Software Foundation	Open Source Initiative	Shareware	Commercial Software
The user can edit the source code	✓	✓		
The user **must** always pay before being able to use the software				✓
The user can redistribute the software	✓	✓	✓	
The user always gets a trial period			✓	

Answer 3

4(a)	**1 mark** per bullet point to **max 3** e.g. • He has ethical guidelines to follow • … so clients/other staff know the standards being applied • … so he does not have to decide what is ethical it's written down • Clients / staff know he is reputable • … recognition of his skills / knowledge • … there may be a test / requirements for entry • They provide help and support • … for example if he needs legal advice • They run training courses • … to keep his skills up-to-date	**3**
4(b)(i)	**1 mark** per bullet point to **max 2** e.g. • He can tell the manager he has not used it • … and how he will get up-to-date • He can perform his own research on how to use it • He can explain to the manager that he needs additional training • He can(ask the manager to book on a training course • He can ask for a mentor / to shadow someone • He can practice at home before starting	**2**
4(c)	**1 mark** per bullet point to **max 2** e.g. • He didn't act in best interest of product • … because the product might fail because he didn't report the error • He didn't act in best interest of client • … because if the product does not work then they have been let down because he didn't report the error • He didn't act in the best interest of the profession • … he is letting his profession down because he didn't report the error • He didn't act in best interest of the company • ... not correcting the error early could lead to later problems	**2**

Answer 4

5(b)	**1 mark** each: • Open Source Initiative • Free Software Foundation	**2**

Answer 5

8	**1 mark** for identification of an application **Max 2 marks** for relevant description e.g. • Police identifying wanted people • Uses image recognition • ... to identify features/characteristics/items in an image • Natural language interfaces • Use speech recognition to identify words that are spoken • ... and adapts to learn regional accents • Self-driving cars • Detects its position on the road and within the traffic • Follows a route // Collision avoidance // Self-parking etc. • Spoken Interfaces • Use natural language processing • ... to take a sentence and work out its meaning • Game playing • Models characters in a computer game • ... to allow computer characters to react according to the player's movements	**3**

Answer 6

9	**1 mark** for each bullet point **(max 2)**. For example: • incorrect recognition of faces leads to mistakes such as • ... access to facilities / systems may be denied • privacy issues / people do not like data being stored • individuals will feel safer • ... there might be a reduction in crime • faster boarding • catching criminals	**2**

Answer 7

8(a)(i)	**1 mark** for each bullet point (**max 2**): • to allow users to customise the code • to allow errors to be reported / identified / fixed by users • to allow additional features to be added to the code • to allow for collaboration	**2**
8(a)(ii)	**1 mark** for each correct point (**max 2**) Example: • enables the program to be copyrighted • prevents illegal changes to the program / protects the source code • prevents illegal copies of the program being made • a fee can be charged for the program	**2**
8(b)	**1 mark** for a correct economic impact and **1 mark** for corresponding description Example: • reduce costs to the garage • ... because less time taken for diagnosis • increase profits for the garage • ... as technicians spend more time repairing, so completing more jobs in a day • decrease costs passed to customer • ... so garage may gain customers • profit margins can be reduced • ... because program may be expensive to buy / maintain / update	**2**

Answer 8

4(c)	**1 mark** each to **max 3** Examples: • Uses image recognition • Monitors every image taken to identify matching images/shapes/features to a 'person' … • … starts recording to secondary storage/permanently when a person is identified • System identifies direction of movement of person and uses this to decide where/how to move the camera/record • System identifies other cameras to start recording based on direction of movement	**3**

Answer 9

7(d)	**1 mark** each to **max 3** • Uses speech recognition • ... which identifies key phrases / words spoken • … and matches these to a database • ... and generates the most likely sentence / command / word	**3**

Answer 10

3(b)	**1 mark** each to **max 3** Examples: • Scans the scene in real time • Identifies if there are faces in the image • Uses facial recognition • ... uses image recognition • ... takes each frame individually • ... analyses the pixels • ... stores pattern for a face • ... looks for patterns that match/come close to the pattern for a face • Camera focuses on the **pattern** identified	**3**

Answer 11

5(b)	**1 mark** for appropriate licence; **1 mark** for each point to **max 3** • Commercial software licence • User has to pay for the product so the programmer can gain an income • Enables the program to be **copyrighted** • ... so the user cannot **legally** edit the program // the programmer retains control over product • … and can take legal action against people who attempt to **illegally** copy it /sell it on • Shareware licence • Enables the program to be **copyrighted** • The user cannot **legally** edit the program so the developer retains control over product • User can try the program for free and then pay for the full game which allows the programmer to gain an income • so more people can experience it and therefore be more likely to buy it	**4**

Answer 12

6(a)	**1 mark** for each bullet point (**max 2**). • Users are able to trial the program and may offer the programmer constructive **feedback** • **More people** might try the program because the trial is free of charge • Allows bugs to be found and corrected on a wide range of computer system configurations improving the programmer's original program • Users that find the trial useful will buy the program so programmer gets **income** • Allows the program to be **copyrighted** and so protects the programmer's intellectual property rights // no **illegal** modification allowed	**2**

6(b)	**1 mark** for each bullet point (**max 4**). • The programmer has ethical guidelines to follow • …so purchasers of programs know the standards being applied • …so programmer does not have to decide what is ethical or not • Clients know programmer is reputable • …recognition of programmer's skills/knowledge • There may be an entry requirement / exam • … so clients know that the programmer is competent • Professional ethical body provides help and support • Such as legal advice // by appropriate example • Enables programmer to attend the ethical body's training courses • …to keep skills up to date // to develop skills	**4**

Answer 13

5(c)(ii)	**1 mark** each to **max 4**: e.g. • Captures an image of the face • Uses image recognition • Trained to identify the features of a face in an image • … using a large number of images • Analyse images for facial features • Uses the probability of a match	**4**

Answer 14

7(b)	**1 mark** each to **max 3**: e.g. • Voice/speech recognition is used • ... to identify if someone speaking • The sound is recorded and analysed • The audio recordings are compared to a database of words/sound waves • ... to identify the word that has the highest probability of being said • Natural language recognition is used • Words are combined and compared to known sentences • … programmed action(s) for matching sentence(s) are performed	**3**

Answer 15

4(a)(ii)	**1 mark** per action to **max 2** For example: • Prepare an induction • Invite Sophie in before starting • Introduce Sophie to the team • Give Sophie a mentor	**2**
4(a)(iii)	**1 mark** only e.g. • Prepare a greeting/introduction • Provide structured support • Invite Sophie to social event(s) before/at the start to meet people	**1**
4(b)	**1 mark** per bullet point to **max 3** • Sophie is confirming that she understands the code of conduct • To make sure Sophie knows what behaviour is expected of her • To make sure Sophie understands there may be consequences of some actions • To ensure all employees adhere to the same standards	**3**

Answer 16

4(c)(i)	**1 mark** per benefit to **max 2** • She can charge a fee for the game • She retains the copyright • ... so, the game cannot be re-distributed by a third-party without her permission	**2**
4(c)(ii)	**1 mark** per benefit to **max 1** • Potentially better support, as she is charging a fee • Likely to have fewer bugs / less prone to malware than if distributed under other licences e.g. open source • Redress available if the game does not function correctly	**1**
4(c)(iii)	**1 mark** per bullet point • They can check it works // check if it meets their requirements • ... without having to paying a fee if it does not	**2**

Answer 17

2(a)	**1 mark** for each correct term □ Commercial Licence □ Free Software Licence □ Shareware Licence □ Open Source Licence	**4**

Answer 18

4(a)	**1 mark** for naming a principle, **1 mark** for description to **max 3 · 2** □ Product □ Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. □ Judgement □ Software engineers shall maintain integrity and independence in their professional judgement. □ Management □ Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance. □ Profession □ Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. □ Colleagues □ Software engineers shall be fair to and supportive of their colleagues. □ Self □ Software engineers shall participate in life-long learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.	6

Answer 19

2(d)	**1 mark** per bullet point to **max 3** For example: He should ... □ ...Keep the client's personal data private □ ...Involve the client in the development // ...Communicate with the client □ ...Provide the solution that the client asked for □ ...Keep the project running on time // budget □ ...Keep the client informed of any problems/delays	3

Answer 20

5(a)	**1 mark** per bullet point to **max 2** ▯ Encryption ▯ Assign a unique code so it will not install without this // product key ▯ Limit the number of times that version of the software can be installed ▯ Set a time limit within which the software must be installed	**2**
5(b)	▯ Provide an .exe file // Compile the source code // Use a compiler	**1**
5(c)(i)	**1 mark** per benefit to **max 2** ▯ So that she can sell the software for a fee // make money from the software ▯ A commercial licence prohibits unauthorised/further copies being made and/or distributed ▯ A commercial licence prohibits any changes to the software	**2**
5(c)(ii)	**1 mark** per bullet point to **max 2** ▯ Open Source ▯ Free Software ▯ Shareware ▯ Freeware	**2**

Answer 21

3(a)	**1 mark** per bullet point, **max 2 marks** per licence Open Source • The source code is released with program • Users can edit the source code to suit their needs • Users re-release their version under the same terms • Can be cost-free but may also need payment Shareware • Users get a free trial of the software • … which may be limited in features • No access to source code // Program cannot be edited • Then they have to pay / sign-up after the expiry date // Then they have to pay / sign-up to get full functionality // Then they have to pay / sign-up to stop unwanted pop-ups, etc.	**4**
3(b)	**1 mark** per bullet point to **max 2 marks** for chosen licence **Open Source** For example: • Hugo does not have to set up ways to take funds • Others may enhance / improve the program • Hugo can charge a fee for the App <u>Or</u> **Shareware** For example: • Hugo can charge for the App • Not giving away the code/people can't copy the code • … Hugo gets the sole recognition for the program • Possible legal consequences if someone does copy the code • If users need to sign up, their data can be used for marketing etc. • Customers have peace of mind that the software hasn't been maliciously edited / bugs introduced	**2**

Answer 22

5(a)	**1 mark** per bullet point for each justification, to **max 2** **Either** Unethical - Work belongs to the company it was created for // copyright - … Kevin cannot use it without permission - It reduces the integrity of the person / profession / new company - Reference to IEEE standards in context **Or** Ethical - The program code could be open source - Kevin might own the copyright of code - Kevin may have permission to use the code - Reference to IEEE standards in context	**2**

5(b)	**1 mark** per bullet point for each justification, to **max 2** **Either** Unethical - Nadya has accepted a role / work she knows she cannot do - This reduces the integrity of the person - She may let down the new organisation who are expecting her to be able to do the work - Reference to IEEE standards in context **Or** Ethical - She is taking steps to prepare for the role - … Without expecting the company to do it - Nadya may have told the company that she didn't know the languages but that she would learn them - Reference to IEEE standards in context	**2**
5(c)	**1 mark** per bullet point for each justification, to **max 2** **Either** Ethical - The individual works as part of the team … - … therefore, the team should / will get the credit - Maria is not lying about who produced it - Reference to IEEE standards in context **Or** Unethical - Maria should identify who / where the idea originated - It prevents the individual getting recognition - Maria is not being supportive of the individual - Reference to IEEE standards in context	**2**

Answer 23

5(a)	**1 mark** per bullet point for each justification, to **max 2** **Either** Unethical • Noah's work may be confidential • Wendy shouldn't claim someone else's ideas / work as her own • She is bringing the profession into disrepute • Reference to IEEE standards in context **Or** Ethical • The code could be open source • Wendy may have permission from Noah • Wendy isn't copying the code, just getting ideas • Reference to IEEE standards in context	**2**

5(b)	**1 mark** per bullet point for each justification, to **max 2** **Either** Unethical • Amit has a responsibility to his company • He should have taken it to the police rather than putting it on the Internet • He has a signed agreement to say he will not give anything away • Reference to IEEE standards in context **Or** Ethical • Amit is acting in the public interest • Amit may not have actually signed the confidentiality agreement • If acting illegally, the multinational company should be brought to justice • Reference to IEEE standards in context	**2**

5(c)	**1 mark** per bullet point for each justification, to **max 2** **Either** Ethical • It might save people's jobs • Farah is acting in the best interest of her company • Reference to IEEE standards in context **Or** Unethical • Farah has a responsibility to act in the best interest of her client • It could give her company a bad reputation • Reference to IEEE standards in context	**2**

Answer 24

3(a)	**Either** Ethical • He is booking the holiday in his own time / lunchtime // he is self-employed • He has been given permission • Reference to IEEE in context **Or** Unethical • Should not use company computer for personal use • Should be working whilst at work • Reference to IEEE in context	**2**
3(b)	Unethical: **Max 2 marks** from • Company will get a bad reputation • Should be supporting his colleague • Reference to IEEE in context	**2**
3(c)	**Either** Ethical • She is supporting her colleague • Working in the best interests of the company • Reference to IEEE in context **Or** Unethical • Praising one team member instead of the whole team • Others in the team may also have contributed, so she is not being supportive of the whole team • Reference to IEEE in context	**2**

Answer 25

5(a)(i)	**1 mark** per bullet point, **max 2** • Restricted use • Source code not provided // source code protected • Anyone can purchase/download if agree to the terms • Limited number of installations allowed // Software key needed to install	**2**

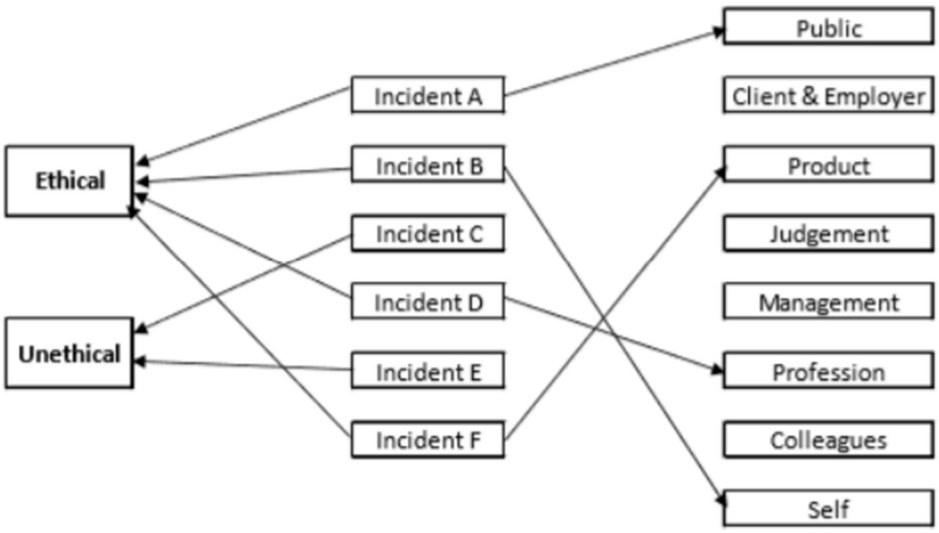
5(a)(ii)	**1 mark** for name and **2 marks** for description **Either** Open Source • The source code is released with the program • Users can change / edit the source code to enhance the game • Users can re-release the game under the same terms // the game might spread more easily **Or** Shareware • Users get free trial or limited access for set time • Users do not have access to the source code // source code may not be edited • At end of trial period, users may have to pay or register to continue using the game // Can get people 'hooked' and then charge a fee **Or** Freeware • There is no fee for the game • The game could be copyrighted • Modification, re-distribution or reverse engineering of the game without permission is prohibited	3

5(b)	**1 mark** per bullet point, **max 3** • Firewall / proxy • Encryption • Username and Password • Physical security • Biometric authentication // by example • Two-step authentication // by example • Anti-malware	3

Answer 26

6(a)	**Two marks** from: ▯ A system of moral principles ▯ That guide behaviour / decision making ▯ Based on philosophical / religious views ▯ By example, e.g. respectful and considerate behaviour	**Max 2**
6(b)	**One mark** for identifying the issue **One mark** for correct principle **One mark** for possible action **Max 2** issues (2 × 3 marks) 1 Uncomfortable with one of his colleagues Client and Employer // Management / Colleagues // Judgement // Self For example: Team building exercises // arranged meeting 2 Unfamiliar with programming language Self // Client and Employer //Product // Profession // Colleagues For example: Undergo training 3 Visit to unfamiliar workplace Client and employer // Management // Judgement // Profession // Colleagues For example: He should speak to his manager to discuss situation	**Max 6**

Answer 27

5		
5(a)	Mark as follows: **Unethical:** C and E 1 Mark **Ethical:** A,B, D and F 1 Mark	**2**
5(b)	Mark as follows: A – Public interest 1 Mark B – Self 1 Mark D – Profession 1 Mark F – Product 1 Mark	**4**

Answer 28

Description	Open source	Shareware	Commercial
Software is purchased before it can be used			✓
Source code comes with the software	✓		
Software is provided free on a trial basis		✓	
The software can be modified by the user	✓		

Answer 29

One mark for identifying the principle, **one mark** for an example that is in the context of this scenario.

Maximum of two marks per principle. **Maximum of three** principles. **[6]**

- PUBLIC / Software engineers shall act consistently with the public interest.
  - Example in context
- CLIENT AND EMPLOYER / Software engineers shall act in a manner that is in the best interests of their client and employer (consistent with the public interest.)
  - Example in context
- PRODUCT / Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
  - Example in context
- JUDGEMENT / Software engineers shall maintain integrity and independence in their professional judgment.
  - Example in context
- MANAGEMENT / Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
  - Example in context
- PROFESSION / Software engineers shall advance the integrity and reputation of the profession (consistent with the public interest).
  - Example in context
- COLLEAGUES / Software engineers shall be fair to and supportive of their colleagues.
  - Example in context
- SELF / Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.
  - Example in context

Answer 30

3 (a) **Two** from: [2]

- The source code comes with the software.
- The user can edit the source code.
- Once edited, the software is re-distributed with the changes.

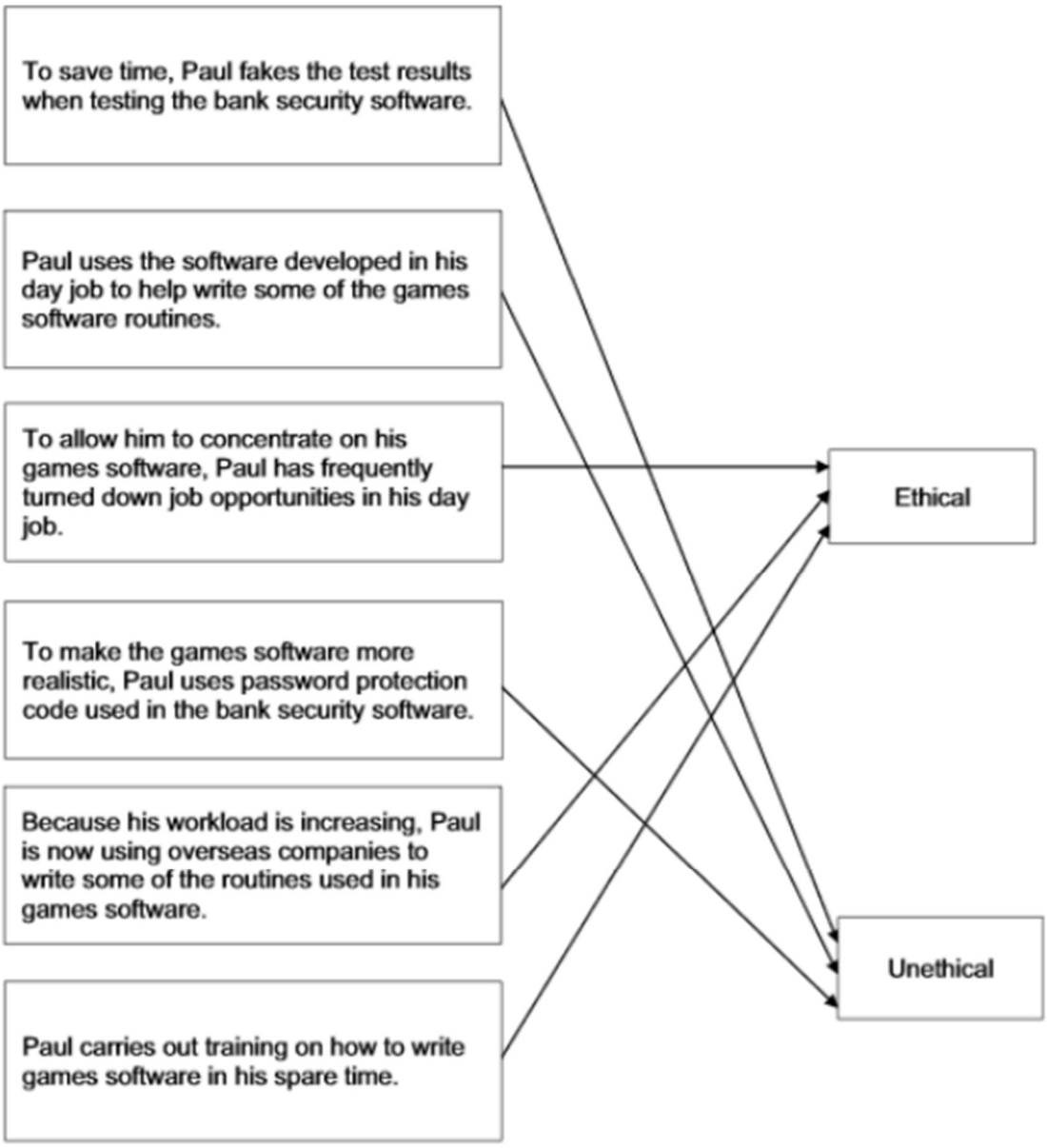
(b) **Two** from: [2]

- The software is purchased.
- With a **licence** which restricts the number of users / possible time period for use.
- The program code for the software cannot be edited.

(c) **Four** from: [4]

- Support / training is readily available so help can be accessed if needed.
- More robust software / fewer bugs as it has been tested more thoroughly/by more users.
- Forums / user groups will exist for popular software.
- Software upgrade path likely to be available (at minimal cost).
- Manufacturer develops patches that can be automatically downloaded.
- Compatibility is inbuilt for other commercial software.

Answer 31


To save time, Paul fakes the test results when testing the bank security software.
Paul uses the software developed in his day job to help write some of the games software routines.
To allow him to concentrate on his games software, Paul has frequently turned down job opportunities in his day job.
To make the games software more realistic, Paul uses password protection code used in the bank security software.
Because his workload is increasing, Paul is now using overseas companies to write some of the routines used in his games software.
Paul carries out training on how to write games software in his spare time.
Ethical
Unethical

Answer 32

5 **One mark** for each correctly placed tick.

Activity	Ethical	Unethical
Gives away passwords used in the intruder detection software		✓
Uses source code developed at the software house for the software he develops for his own company		✓
Insists that staff work to deadlines	✓	
Turns down training opportunities offered by his employer		✓
Writes and sells software that reads confidential data from client computers		✓
Fakes test results of safety-critical software		✓
Has the software applications developed overseas for sale in his own country	✓	

[7]