7.1 Ethics and Ownership Notes

Objective:

- Show understanding of need for and purpose of ethics as computing professional, Understand the importance of joining a professional ethical body including BCS (British Computer Society), IEEE (Institute of Electrical and Electronic Engineers)
- Show understanding of need to act ethically and the impact of acting ethically or unethically for a given situation.
- Show understanding of need for copyright legislation
- Show understanding of different types of software licencing and justify use of a licence for given situation. Licences to include free Software Foundation, Open Source Initiative, shareware and commercial software.
- Show understanding of Artificial Intelligence (AI). Understand impact of AI including social, economic and environmental issues. Understand the applications of AI.

Importance of Ethics

Societies are collection of individuals, each having their **own ideas** and **beliefs** about type of behaviour that is acceptable, or not acceptable. These ideas and beliefs can vary widely, and what one person believes is good and right, another may see as bad and wrong. To make sure that societies function successfully, they develop principles that define what is morally good and right behaviour for individuals and society itself. These principles are known as **ethics**.

Important Points when considering Ethical Behaviour:

- **Legal** covers the law, whether or not an action is punishable by law. Anything which breaks law is termed illegal. Examples include copying software and then selling it without permission of the copyright holders.
- **Morality** concerns questions of right and wrong. Morality is human desire to distinguish between right and wrong. This varies from person to person, and between cultures (something that is considered immoral in one culture, may be acceptable practice in another)
- **Ethics** also concerns questions of right and wrong, but is more often used in a professional context.
- **Culture** refers to attitudes, values and practices shared by a society or group of people.

Immoral does not mean something is illegal. Creating a fake news website is not illegal, but it may be considered immoral if it causes distress to others. If the creator tried to obtain personal and financial data, then it would be become an illegal act.

Hacking is generally regarded as immoral, but not illegal. However, it becomes illegal if it compromises national security, or results in financial gain, or reveals personal information.

Unethical Behaviour is **breaking** of code of conduct. If somebody works for software company and passes on some ideas to rival company, this would be regarded as **unethical** behaviour. If software is related to national security or is formally copyrighted, then it is also **illegal**.

Computer Ethics

Computer ethics is a set of **principles** set out to regulate the use of computers. Three factors are considered:

- **Intellectual property rights**.Example, copying of software without the permission of owner.
- **Privacy issues**, Example, hacking or any illegal access to another person's personal data.
- **Effect of computers on society**, Example, job losses, social impacts, and so on.

Professional Ethical Bodies

There are a number of professional bodies representing individuals working in fields of computing and information technology that have developed their own codes of conduct, to which members are expected to adhere.

British Computer Society (BCS):

British Computer Society is an international body which works in close partnership with other groups to monitor and to represent rights and ethical practices of all professionals working in IT and computing industries.

BCS Code of Conduct covers **four** main areas:

- **The Public Interest** - Safeguarding public health; respecting rights of 3rd parties, applying knowledge of relevant regulations.
- **Duty to employers and clients** - Carrying out work according to requirements, and not abusing employers' or clients' trust in any way.
- **Professional Duty** - Uphold the reputation of the profession through good practice, support fellow members in professional development.
- **Professional Integrity and Competence** - maintain standards of professional skill and practice, accepting responsibility for work done, avoiding conflicts of interest with clients.

IEEE-CS/ACM

Association for Computing Machinery (ACM) and Institute of Electrical and Electronics Engineers (IEEE) are both based in USA have published the code of ethics.

Software Engineering Code of Ethics:

1) PUBLIC - Software engineers shall act consistently with public interest.

2) CLIENT AND EMPLOYER - Software engineers shall act in a manner that is in best interests of their client and employer consistent with public interest.

3) PRODUCT - Software engineers shall ensure that their **products** and related modifications meet highest professional standards possible.

4) JUDGMENT - Software engineers shall maintain integrity and independence in their professional judgment.

5) MANAGEMENT - Software engineering managers and leaders shall subscribe to and promote an ethical approach to management of software development and maintenance.

6) PROFESSION - Software engineers shall advance **integrity** and reputation of the profession consistent with the public interest.

7) COLLEAGUES - Software engineers shall be fair to and supportive of their colleagues.

8) SELF - Software engineers shall participate in **lifelong learning** regarding practice of their profession and shall promote **ethical approach** to practice of profession.

Applying ACM/IEEE Code of Ethics Principles

Self-Driving Car

'**Google car'** is concept for a **self-driving car** that autonomously takes passenger where they wish to go. When designing, building and testing software for car, developers had one principle placed above all others: **Safety** of **passenger** and **public**.
In doing so, developers had to consider **ethical questions about safety** and **breaking law**.
Scenario: A passenger in Google car may fall ill and need urgent hospital attention. Google car is programmed to stay within speed limits, even if road is clear. However, keeping to speed limit may mean that passenger does not receive medical treatment in time. Google's developers have to consider **ethical considerations** of both passenger and public. In this situation, speeding may endanger public, but driving legally might endanger passenger.

Smart Watch

Introduction of **smart watches** has raised **privacy concerns** that developers have to address. Many smart watches have **health-monitoring facilities** such as detection of heart rate. Data from this monitoring is often sent over internet to **third-party applications**, to help users monitor their fitness. Developers have an **ethical duty** to make sure that this data remains **private:** and make sure that data is **transmitted securely**, and developers of third-party applications have to make sure that data remains **private**.

Network Monitoring

In workplace, computer users might find themselves placed in situation with conflicting ethics.
Example: Management of company might suspect that employee is wasting work time accessing social networking sites on company's computers. This highlights importance of having **computer code of conduct** in place. If code of conduct forbids access to social networking sites via company's computers, then management have **ethical right** to check that code is being upheld. Without a code, checking on employee could be considered an

invasion of privacy. However, even with a code of conduct, to behave ethically company could only check on those employees for whom they have **evidence** of unethical behaviour, as employees' privacy must still be considered.

Exam Style Question

For each workplace scenarios, unethical behaviour is demonstrated. Explain Principle(s) which are not being met.

(i) Workplace Scenario 1:

A large project is devolved to project teams, each led by a project leader. One project leader fails to inform his manager that he has major concerns that:

- Their team's software contribution is taking much longer to write and test than anticipated.
- They are consequently at risk of spending over their allocated budget.

Answer:

Management at fault need to keep whole project staff fully informed – i.e. a MANAGEMENT issue. This could impact on whole project – i.e. a PRODUCT issue.
JUDGEMENT of the project leader is poor.

(ii) Workplace Scenario 2

Software house is about to train a number of programmers in a new programming language. Two employees are refusing to attend the training.

Answer:

A **SELF** issue – staff should be expected to keep their skills up to date. It could be the EMPLOYER is not able to move quickly into new areas of work.

(iii) Workplace Scenario 3:

Company is developing some monitoring software which requires sensors placed in a nature reserve. One employee considers the sensors will be a danger to some of the wildlife, but is told by his manager that the matter is none of his concern.

Answer:

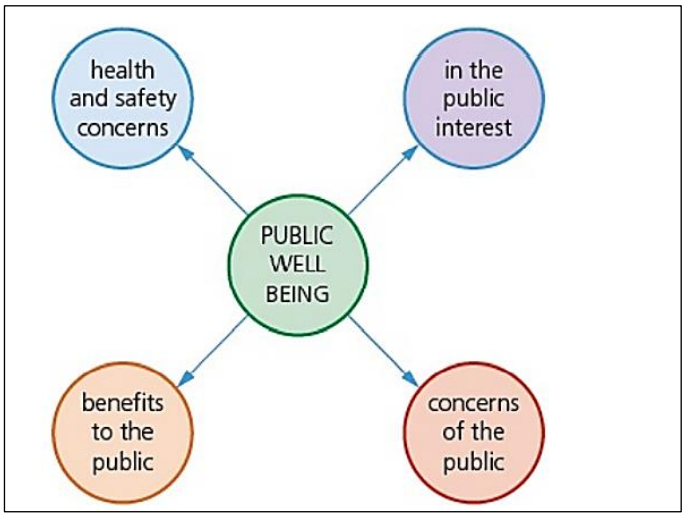
This is a **PUBLIC** interest issue. Employee has used good **JUDGEMENT** in bringing issue into open discussion.

Impact on Public

BCS code has statement that professional should:

'have due regard for public health, privacy, security and wellbeing of others and the environment'.

7.1 Ethics and Ownership Notes



Issues which can affect general public and businesses include;

- Companies selling software systems which do not meet required standard for **security** (inadequate protection against hacking, spyware and other security issues)
- Covering up of security issues (such as XEN security threat which forced several cloud servers to become compromised – an attempt was made to cover up issue but the affected cloud operators had to come clean)
- Release of **private data** (such as photo leaks, when a cloud server was hacked)
- Social media not policing **subversive activity**, such as hate mail and cyber bullying.
- **Search engines** giving results at **top of search** due to donations to search engine operators.

Software Copyright and Privacy

Copyright is a formal recognition of ownership of a created and published work.

An exception is if individual is working for an organization. An organization can claim copyright for a published work if it is created by one or more individuals that work for organization.

Copyright cannot apply to an idea and it cannot apply to a component of a published work.

Copyright can apply to any of:

• Literary work • Musical composition • Film a music recording • Radio or TV broadcast
• Work of art • Computer program

Justification for Existence of Copyright:

- Creation **takes time** and **effort** and requires original thinking. There should be opportunity for copyright holder to be rewarded financially for this effort.
- It is unfair for some other individual or organization to reproduce work and to make money from it without any compensation to original creator.

Copyright Laws:

Copyright laws are needed to protect copyright. Different countries have different laws but there is an international agreement that copyright laws cannot be avoided, by someone publishing work in another country without original copyright holder's permission.

Typical **copyright legislation include:**

- Requirement for registration recording the date of creation of the work
- Defined period when copyright will apply
- Policy to be applied if an individual holding copyright dies
- Agreed method for indicating copyright, for example the use of the © symbol.

Software Licensing

Software license is legally binding agreement that specifies terms of use for an application and defines rights of software producer and of the end-user.

Commercial Software It is a **copyrighted** software that must be **paid** for. The copying, distribution and selling of such software is restricted to those individuals or organisations that hold a licence to that software. Special rates might be available for educational use.

Freeware Software that is **copyrighted** but made available free of charge. Keeping hold of copyright allows author to retain control and ownership of software in case they wish to charge for it or develop it in future. The licence does not allow software to be modified.

Shareware **Shareware** is copyrighted commercial software that is initially given away on a **free basis**. Software usually remains free to use for a limited period of time, after which a licence must be obtained. Software is often made available as shareware to allow users to try it out and to encourage its **distribution**. Shareware licences do not allow software to be **modified**. **Beta test** version of new software might be considered to come in shareware category.

Free software and the Open Source Initiative

Free Software Foundation and **Open Source Initiative** are non-profit organisations that promote benefits of giving users freedom to **run**, **copy, change** and **adapt software**. Software is not protected by **copyright** restrictions.

Examples of software: F-spot (photographic manager), Scribus (word processor) and LibreOffice (Office Suite).

Users are allowed to follow four freedoms:

- Run the software for any **legal purpose** they wish.
- Study the program **source code** and **modify** it where necessary to meet their needs.

- **Redistribute copies** of the software to friends and family.
- **Distribute code** modified by the user to friends and family.

User Need to follow following rules: Users cannot

- Add source code from another piece of software unless this is also described as free software or open source software.
- Use source code to produce software which copies existing software which is subject to copyright laws.
- Adapt source code in such a way that it infringes copyright laws protecting other software.
- Use source code to produce software which is deemed offensive by third parties.

Artificial Intelligence

Artificial intelligence (AI) is a machine or application which carries out a task that requires some degree of intelligence when carried out by a human being.

These tasks could include

- The use of a language
- Carrying out a mathematical calculation or function
- Recognising a person's face
- The ability to operate machinery, such as a car, an aeroplane or a train
- Analysing data to predict outcome of a future event, such as weather forecasting.

Impacts of AI on society, the economy and Environment:

Problem Solving:

Example is traditional form of **expert system** that has been developed to aid **medical diagnosis**. This is supplied with **data** and **rules** from **living** medical experts. Expert system contains more knowledge than is possible for an individual doctor to have. However, if expert system is given a new situation that is not covered by data and rules it has been given, it cannot attempt a new or creative approach – unlike a human.

Linguistics:

Voice recognition and **voice synthesis** techniques are already developed and in use. **Example:** if you call a **help line** where you might be answered by a computer. Provided that you answer questions clearly, computer might be able to identify your needs and pass you on to an appropriate human who can help.

Perception:

Robots have been used in **manufacturing processes**. Robot is programmed to perform **repetitive tasks**. Action of robot each time is triggered by some mechanism. However, if anything unexpected happens, robot continues to operate as normal, regardless

of any damage being caused.

Example of Perception in AI:

Autonomous robots have to be fitted with s**ensors** to enable robot to take appropriate action depending on information received from sensors. A development of this concept is **driverless car**. An example is capability for a car to **park itself** in a vacant parking space.

- **Reasoning**

  There are examples of application of AI where a program has been able to **draw inferences** and reach **conclusions** based on **evidence** which is a requirement for reasoning. Best examples concern proving of **mathematical theorems.**

- **Learning**:

  Machine learning is said to take place if a system that has a task to perform is seen to improve its **performance** as it gains **experience**. AI system has access to 'experience' in the form of a massive set of data. By use of algorithms, system learns from this data.

  One **example** is when actions of users visiting websites to buy products are stored. AI system then attempts to identify appropriate **products** to be advertised when a user returns to website. If sales progressively increase there is evidence that learning is taking place.

  Another **example** is program that investigates **incoming emails** and makes decisions as to whether these can be classified as **spam** and therefore should be refused entry to user inbox.

The impact of AI

Global organisations that are **collecting** and **storing massive** amounts of data concerning how Internet is being used. If this data is only being used to enable organisation to increase its profits, this could be seen as normal business practice. However, if data is not being securely stored it could get into wrong hands and be used for criminal or subversive activity.

There are different concerns with respect to introduction of **autonomous mechanical** products such as robots, robotic devices and driverless vehicles into our daily lives.

Technological developments lead to employment of more people to manufacture, service and install the new products.

More technology leads to less **manual labour** and therefore to increased **leisure time.** One counter argument is that more technology leads to **fewer jobs** because machines are doing work. Such developments simply make rich richer and poor poorer.

Some people are excited by introduction of **driverless vehicles**, but other people believe that potential for accidents will be increased and that there are not enough measures to prevent accidents.

Robots can be used in environments that would be dangerous for humans to enter. Giving robot the capability to act autonomously would make it more useful in such environments.

Environmental impact of **robot manufacture** and **disposal** is most significant issue. Robots are manufactured and require materials for their construction. There is only a limited supply of raw materials needed. Also, all mechanical and electronic devices eventually end up on the scrap heap contributing to already serious problem of waste products harming the environment and creatures living in this environment.

Use of improved **expert systems** to aid practicing doctors and nurses is clearly a benefit. However, if these systems came to replace doctors and nurses social consequences are difficult to predict.

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ESQ: CCTV system uses Artificial Intelligence (AI) to identify presence of a person in the house and to track their movements. Describe how AI is used in this system. 9618/M/J/23

Ans:

- 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

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