QUESTION ONE (14 MARKS) compulsory

a. Discuss the role of management in software engineering [6 marks]

Software engineering includes project, people, process, and the product. To deliver a viable system, the four p's must be well managed.

Project: *the task at hand must be understood*

People: *by whom the system is done*

Process: *the manner in which the solution is realized*

Product: *the artifacts produced (deliverables)*

Nb: all this requires an element of management

b. The university is in the process of acquiring systems for use. As a software engineer, give a summary on the essential attributes of importance that must be put into consideration before a software system is accepted to the organization. [6 marks]

- ✓ *Maintainability*
  - *Software should be written in a way so that it can evolve to meet the changing needs of customers.*
- ✓ *Dependability & security*
  - *Includes range of characteristics eg, reliability, security, safety etc.*
- ✓ *Efficiency*
  - *Economic use of resources, responsiveness, speed, etc.*
- ✓ *Acceptability*
  - *Understandable to the users, usable, compatible with other systems etc.*
- ✓ *Cost.*
- ✓ *Provides required functionality*
- ✓ *User friendly*

c. State four factors that contribute to software crisis in the world [2 marks]

- ✓ *Large and complex problems,*
- ✓ *Lack of adequate training in software engineering, and development*
- ✓ *Increasing skill shortage,*
- ✓ *Low productivity improvements.*
- ✓ *Technological changes*
- ✓ *Dynamic business functions*

QUESTION TWO (14 MARKS)

a. Testing is an integral part of system development. Discuss the role and the criteria for testing a system before use. [6 marks]

- ✓ *Testing is the process of exercising or evaluating a system by manual or automatic means to verify that it satisfies specified requirements or to identify differences between expected and actual results.*
- ✓ *Testing tries to make sure that the product does exactly what is supposed to do. It evaluates to ensure that it meets the user's explicit and implicit requirements. Explicit (utility and performance), explicit (reliability and robustness*
- ✓ *Testing demonstrates the presence of errors*
- ✓ *The process of executing a software product with the intention of finding errors,*
- ✓ *Testing is a set of tasks that can be planned in advance and conducted systematically to realize the final software product.*

Criteria:

- ✓ **Utility** is the extent to which a user's needs are met when a software product is used under conditions permitted by its specifications.
- ✓ **Performance** refers to the extent to which the product meets its constraints within response time and space requirements.
- ✓ **Reliability** is a measure of the frequency and criticality of product failure, where failure is an unacceptable effect or behavior occurring under permissible operating conditions.
- ✓ **Robustness** is essentially a function of a number of factors such as range of operating conditions and the acceptability of effects and behavior under non-permissible operating conditions.

- ✓ **Learnablity** is the ability of a user to become productive with the new system.
- ✓ **Recoverability** is the ability to reinstate back previous values prior failure of system
- ✓ **Adaptability**
- ✓ scalability

b. Distinguish between the following software engineering terms. [4 marks]

i. Verification and Validation

- ✓ ***Verification*** *is the process of evaluating a system or component to determine whether the products of a given development phase satisfy the conditions imposed at the start of that phase.*
- ✓ ***Validation*** *is the process of evaluating a system or component during or at the end of development process to determine whether it satisfies the specified requirements .*

ii. Alpha tests and Beta test

- ✓ ***Alpha Tests*** *are conducted at the developer's site by some potential customers. These tests are conducted in a controlled environment. Alpha testing may be started when formal testing process is near completion.*
- ✓ ***Beta Tests*** *are conducted by the customers / end users at their sites. Unlike alpha testing, developer is not present here. Beta testing is conducted in a real environment that cannot be controlled by the developer.*

c. Software may be retired only if it becomes obsolete. Discuss some of the factors that contribute to this scenario. [4 marks]

- ✓ *Change in environment*
- ✓ *Change in infrastructure/technology*
- ✓ *Major change in requirements*
- ✓ *Increase in complexity*
- ✓ *Extremely difficult to maintain*
- ✓ *Deterioration in structure of the code*
- ✓ *Slow execution speed*
- ✓ *Poor graphical user interfaces*

QUESTION THREE (14 MARKS)

a. Discuss the key challenges facing software engineering. [6 marks]

- ✓ *Coping with legacy systems, coping with increasing diversity and coping with demands for reduced delivery times.*
- ✓ *Legacy systems*
  - ➢ *Old, valuable systems must be maintained and updated*
- ✓ *Heterogeneity*
  - ➢ *Systems are distributed and include a mix of hardware and software*

- ✓ *Delivery*
  - ➢ *There is increasing pressure for faster delivery of software*

- ✓ *Developing of trustworthy systems that reflect the organizations structure and order.*

b. Discuss the issues of professional responsibility in software engineering. [4 marks]

- ✓ *Confidentiality*
  - ➢ *Engineers should normally respect the confidentiality of their employers or clients irrespective of whether or not a formal confidentiality agreement has been signed.*
- ✓ *Competence*
  - ➢ *Engineers should not misrepresent their level of competence.*
  - ➢ *They should not knowingly accept work which is outwith their competence.*
- ✓ *Intellectual property rights*
  - ➢ *Engineers should be aware of local laws governing the use of intellectual property such as patents, copyright, etc. They should be careful to ensure that the intellectual property of employers and clients is protected.*
- ✓ *Computer misuse*
  - ➢ *Software engineers should not use their technical skills to misuse other people's computers. Computer misuse ranges from relatively trivial (game playing on an employer's machine, say) to extremely serious (dissemination of viruses).*

c. Discuss the importance of software engineering in the design and development of systems. [4 marks]

- ✓ *Tool that drives business decision making process*
- ✓ *Basis for modern scientific investigation and engineering problem solving*
- ✓ *Equipment of the skills and knowledge to manage and run complex and large projects*
- ✓ *Key factor that differentiates modern products and services*

QUESTION FOUR (14 MARKS)

a. Explain the role of a *Process Model* in software engineering. [3 marks]

- ✓ *A set of ordered tasks involving activities, constraints and resources that produce an intended output of some kind.*
- ✓ *A process is important because it imposes consistency and structure on a set of activities.*

- ✓ *It guides our actions by allowing us to examine, understand, control and improve the activities that comprise the process.*

b. *E-mauzo* is a recently established company in the business of buying and selling used computers. It has been in operation for 5 years and looks forward to improve its business process by automating some parts of its existing manual process, in the quest of gaining competitive advantage over its rivals. The *E-mauzo* management has decided to go online for transactions and plans to develop a web portal to display its stock of computers. With the new system, buyers can request a catalogue of the stock whereas sellers can post details of their computers online. *E-mauzo* will notify successful tenderers in due course.

Requirements:

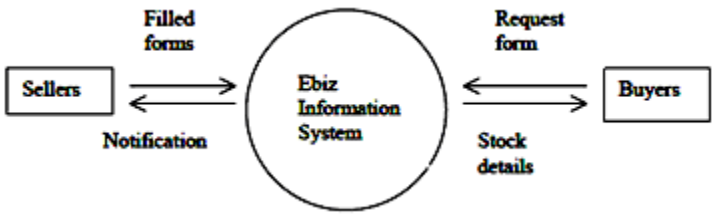
i. Determine the most suitable process models to *automate the core business processes* of *E-Mauzo* and the most suitable model to *develop the interfaces* with customer feedback. [2 marks]

- ✓ *To automate the core business process of E-Mauzo- Linear sequential model*
- ✓ *To develop the interfaces with customer feedback- Evolutionary prototyping*

ii. List **three** possible functional requirements of the *E-mauzo* system. [3 marks]

- ✓ *Buyers need to request a catalogue of the stock.*
- ✓ *Sellers need to post details of their computers to the system.*
- ✓ *E-mauzo needs to notify successful tenderers*

iii. Draw a data flow diagram to correctly depicts the flow of data in *E-mauzo* business system? [3 marks]



c. Explain the Root Causes of Software Development Problems [3 marks]

- ✓ Inaccurate understanding of end-user needs

- ✓ Inability to deal with changing requirements
- ✓ Modules that do not fit together
- ✓ Software that is hard to maintain or extend
- ✓ Late discovery of serious project flaws
- ✓ Poor software quality
- ✓ Unacceptable software performance
- ✓ Untrustworthy build-and-release processes

QUESTION FIVE (14 MARKS)

a. Distinguish between project and project management. [2 marks]

- ✓ *Project is an organized programme of pre determined group of activities that are non routine in nature and that must be completed using the available resources within the given time limit.*
- ✓ *Project management is an organized venture for managing resources. It involves scientific application of modern tools and techniques in planning, financing, implementing, monitoring, controlling and coordinating unique activities or tasks to produce desiriable outputs in accordance with the pre determined objectives within the constraints of time and cost.*

b. A company is in view of hiring software engineer / project manager to manage the software systems in the company. Provide a detailed list of the factors of importance to be considered to hire a potential candidate. [5 marks]

- ✓ *Planning and organizational skills.*
- ✓ *Personnel management skills*
- ✓ *Communication skills*
- ✓ *Knowledge of technology*
- ✓ *Conflict resolving capacity*
- ✓ *Familiarity with the organization*
- ✓ *Change orientation*
- ✓ *Effective time management*
- ✓ *Ability to handle project management software tools / packages*
- ✓ *Ability to solve problems in totality*

c. Discuss the role of software requirements specification (SRS) in software development. [7 marks]

- ✓ *An SRS establishes the basis for agreement between the client and the supplier on what the software product will do.*
- ✓ *An SRS provides a reference for validation of the final product.*
- ✓ *A high-quality SRS is a prerequisite to high-quality software.*
- ✓ *A high-quality SRS reduces the development cost.*
- ✓ *An SRS minimizes the challenges, termination, had hocks in software development process.*
- ✓ *Defines the final system in totality at the initial stages of development.*

QUESTION SIX (14 MARKS)

a. Cost estimation is a fundamental element in software engineering. Discuss the benefits of this task to a software engineer. [4 marks]

Benefits of cost estimation:

- ✓ *Planning*
- ✓ *Controlling costs*
- ✓ *Efficiency enforcement*
  - *Ability to take tasks quickly and accurately*
- ✓ *Subjectivity*
  - *Use to weigh other values with other values*

b. Discuss the various software cost components that must be considered when acquiring a software product for use in an organization. [4 marks]

- ✓ *Hardware and software costs*
- ✓ *Travel and training costs*
- ✓ *Effort costs (salaries to engineers, social and insurance costs)*
- ✓ *Maintenance costs*

c. COCOMO mode is widely used in software engineering for cost estimation. Give a brief summary of this model. [6 marks]

COCOMO (CONSTRUCTIVE COST MODEL)

Interactive cost estimation software package that models the cost, effort and schedule for a new software development activity.

Can be used on new systems or upgrades

Derived from statistical regression of data

Provide computational means for deriving S/W cost estimates as functions of variables (major cost drivers)

Functions used contain constants derived from statistical analysis of data from past projects:

can only be used if data from past projects is available

must be calibrated to reflect local environment

relies on initial size and cost factor estimates which themselves are questionable

QUESTION SEVEN (14 MARKS)

a. Explain the goals and objectives of software engineering in the current world. [6 marks]

- ✓ *Satisfaction of user requirements*
- ✓ *Production of high reliable systems*
- ✓ *Low maintenance costs*
- ✓ *Delivery on time*
- ✓ *Low production costs*
- ✓ *High performance*
- ✓ *Ease of reuse*

b. Software engineering is governed by standards. Explain the importance of these standards to engineers in software development. [3 marks]

- ✓ *Standards provide the solid framework for quality assurance processes.*
- ✓ *Standards help the next person to continue previous persons work without breaking any continuity.*

- ✓ *Use of software standards avoids making past mistakes. It helps in capturing the necessary and important things that are required for software development.*

c. Discuss the factors that affect the final product. [5 marks]

- ✓ *Process quality*
- ✓ *Development technology*
- ✓ *People skills*
- ✓ *Project cost and schedule*
- ✓ *Process model used*