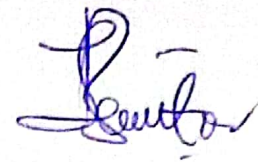


2021/BSE/030/PS



MBARARA UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF COMPUTING & INFORMATICS

DEPARTMENT OF SOFTWARE ENGINEERING

End of Semester One Examination for the Degree of Bachelor of Software Engineering

Course Code	:	SWE 2106
Course Name	:	Cloud Computing
Course Year	:	Two
Academic Year	:	2023/2024
Date	:	20 th April, 2023
Duration	:	Three hours
Time	:	1 week (26 th April, 2023)

Instructions:

- 1) The paper has one section that is compulsory.
- 2) This is an Open Book and practical Examination – Candidates should consult Reference Material during this sitting.
- 3) Any form of Examination Malpractice WILL lead to discontinuation from the University.
- 4) Indicate all your answers in the report format as provided in the exam.
- 5) Only printed (hard) copies will be accepted.

Preamble:

As a branch of computing and engineering, software engineering systematically encompasses the design, development, testing, and maintenance of software applications. Taking software engineering to the cloud is enriching and involves applying cloud computing services and principles to achieve your project goals. Cloud computing brings near-computing advances so that developers, users, and providers can realize scalability, cost-efficiency, disaster recovery, redundancy, fast provisioning of resources, multiple models and offerings, wide geographic reach, and easy deployment of products. Also identified as a paradigm used for computing, the cloud application has been witnessed in the development of products utilized in diverse industries such as agriculture, climate change, environment, health (public health, biomedical, assistive health), education, transport, entertainment, and tourism, to name a few.

To bring our focus onto industry, scholars have demonstrated that the computing paradigm has changed the way software engineers carry out the overall software engineering process and have coined a new model of software development - *the cloud computing software development life cycle model*. An example implementation of such a model is the one by Babar, M., et al. (2017).

Also, withstanding is that when we aim at leveraging the cloud computing paradigm in order to twist and enhance quality of service for most user applications, a variety of challenges are realised in practice. These challenges continue to affect the paradigm's adoption across industry. However, regardless of these industry needs to be ready for the computing practice as the benefits of leveraging it for next generation computing are tremendous and this is visible across all sectors.

Singling out some of the challenges for cloud infrastructure is security and privacy. Various security and privacy challenges have derailed industry's uptake of the paradigm to an extent that regulatory bodies and cloud implementation authorities like – Cloud Security Alliance, and national regulatory such as NIST for the US, NITA-U for Uganda. These continue to avert the challenge with continuous education (*seminars, webinars, research symposia, conferences*), recommendation, and policy implementation to ensure compliance to standards, regulations, and to advance some of the good practice. These approaches are very important to all practitioners regardless, as these are reawakening / refreshing especially for software engineers, IT and computing personnel as they extend IT services and support to diverse users.

Question

As you are prospective grandaunt from the cloud computing course, you are challenged with the state of the computing paradigm's adoption and are tasked with advancing its usage in a specific sector such as *agriculture, global health and biomedicine, entertainment, e-commerce, education, defence, among others*. With a single selection of sector like previously observed in your various semester course projects as a case reference, relate to these to attempt solutions for the following inquiry. Use a report format in order to make an individual attempt and utilise the divisions below as sections.

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a) Introduction

- i. **Description and definition** – various cloud computing scholars describe the cloud differently. However, these definition attempt to triangulate towards a single definition. Observe the various definitions and attempt the triangulation. (*Will require illustration of you achieve the triangulation, of course, not forgetting the references used of the scholarly works*). [5 points]
- ii. **Adoption** – how do we observe the paradigm's adoption in your sector of choice? How has it been adopted? What is hindering full-scale adoption? Who are the actual adopters (*stakeholders*). [10 points]
- iii. **Service provisioning** – as we aim to advance and leverage the computing practice in the selected sector, three service models and four deployment models are suggested.
 - Which ones are these? [0.5 x 3 = 1.5 marks]
 - Using an example reference, how have we observed this in actual practice? [3.5 points]

b) Challenge statement

- i. **Challenge** – with selected sector, how do you characterise the challenge at hand? (This is the challenge presented in your course semester project). [2 points]
- ii. **Solution** – what are possible solutions to the challenge above? [2 points]
- iii. **Recommendation for users** – in order to use and consume the suggested cloud solution, prospective users will need to understand all it takes to shift their computation needs / demands to the cloud. What are some of the requirements that they need to understand / put to focus? How did you elicit these requirements? Consider the meetings, observation of the stakeholders and the business requirements in question. [6 points]

c) Application

- i. **Software development process** – using recent advances in the software process models like the one proposed above, how do you realise the solution in (b (ii)) above. (*This will require you to document how you utilise the cloud SaaS software development life cycle, in a phased approach. Show your understanding of this especially even when you describe the planning and management – cloud project management tools integration like Trello, or Jira; the design diagrams – UML diagrams, web services, the SOA; the implementation – visual studio cloud; hosting – cloud hosting provided by any known hosting providers*). [20 points]
- ii. **Description of service solutions** – the solution space is diverse, hence the term shared pool of resources, as used in the cloud computing definition.
 - How does the SaaS prototype look like? (*Describe all the interfaces – input and output of the service solution*). How is the SaaS prototype that you are offering accessed [15 points]

- What are system requirements for a prospective user to consume your cloud service (*This can include browser requirements, machine specifications, among others. Use a table design to document these requirements and specifications*)? [5 marks]

iii. **Application of concepts and evaluation** – in regards to quality of service attainment for your cloud service solution, what are these service requirements that will need to be realised. *Remember* – in addition to the definitive service requirements of on-demand service, scalability, pay as per use, etc, other quality of service can exist such as reliability, security and privacy, replicability, service efficiency of 100x, fault tolerance, name but a few.

- How are these realised with your selected service provisioning (SaaS) on either private, public, community or hybrid environment? At least, a choice of 5 quality of service requirements will be sufficient [15 points]
- Against available storage solutions, what cloud storage enhancements are you integrating for your cloud application, and why, so that you realise the service benefits? [3, 2 = 5 Points]

iv. **Developer challenges** – what are some of the challenges software engineers / developers encounter as they script and code the service solutions? How has industry and academia managed these challenges? [5 points]

d) **Conclusion:** Provide a conclusion on the report contents and task. [3 points]

e) **References:** All scholarly works, websites, name a few should be included under the references / bibliography section. [2 marks]