FACULTY OF SCIENCE
ACADEMY OF COMPUTER SCIENCE AND SOFTWARE ENGINEERING

MODULE	**IFM03B3 & IFM3B10** INFORMATICS 3B: ADVANCED SOFTWARE ENGINEERING
CAMPUS	APK
FINAL SUMMATIVE ASSESSMENT	JANUARY 2021 (SSA)

DATE	JAN 2021	**DOWNLOAD ALLOWANCE**	08:30–08:40
		WRITING TIME	08:40–11:40
		UPLOAD ALLOWANCE	11:40–12:40

ASSESSORS		PROF W.S. LEUNG DR F.F. BLAUW

EXTERNAL MODERATOR		PROF A. VAN DER MERWE *(UNIVERSITY OF PRETORIA)*

DURATION	*DOWNLOAD TIME*	*10 minutes*	**MARKS**	150
	WRITING	*3 Hours*		
	UPLOAD TIME	*1 Hour*		

INSTRUCTIONS

- ☞ Length of this question paper (including this cover page): 5 (five) pages.
- ☞ ALL Questions must be answered.
- ☞ This test must be completed by yourself within the prescribed time limit.
- ☞ You may NOT copy and paste answers from any source. All answers must be written by yourself during this assessment.
- ☞ You are bound by all university regulations. Please take special note of those regarding assessment, plagiarism, and ethical conduct.
- ☞ You must complete and submit the "Final Summative Assessment SSA Honesty Declaration" document to EVE. Submissions without an accompanying declaration will NOT be marked.
- ☞ You may submit scanned pages as per the instructions provided to you on EVE.
- ☞ Submissions must be successfully made to Eve by 12:40 on the day.
- ☞ No communication concerning this assessment is permissible during the assessment session except with your lecturers.

PLEASE MAKE SURE YOU FULLY UNDERSTAND THESE INSTRUCTIONS.
The Academy reserves the right to check your submission for originality. Make certain that the work you submit is your own.

DO NOT COMMUNICATE WITH YOUR FELLOW STUDENTS DURING THIS TIME
IF IN DOUBT, ASK ONLY DR BLAUW OR PROF LEUNG VIA...
(instructions to be finalised)

Note for moderator:
This page will repeat assessment instructions we will make available to students to help them prepare their submissions.

It will for example provide information on submitting scans of handwritten text.

HONESTY DECLARATION

Make sure you have completed and submitted your Honesty Declaration form.

Due to the lockdown, a considerable percentage of MobileZA's data contract customers have not been using their monthly data allocations. On the other hand, students across the country have found themselves struggling to attend live classes and complete their assignments and assessments due to them not being able to afford the high prices of data.

The Community Engagement Division of MobileZA has put forth the idea of offering MobileZA data contract customers the ability to donate their monthly data allocations to students in need. The idea is to implement a system that will allow contract data customers to register on the DataDonor app. Data contact customers who are registered will then be able to see how much data they currently have available and select the "Donate my Data" button to transfer their data (they will get to choose much of data to give) into a community pool. In addition, users may also buy additional prepaid data to be added to the community pool. Users are permitted to either pay for the additional prepaid data using their credit or debit cards, an electronic funds transfer (EFT) payment, or charged to their monthly contract bill.

Students wishing to apply for additional data may do so by registering on the DataDonor app. To prevent abuse, students are permitted to request for additional donated data of 3GB at a time. MobileZA will consider a number of factors that include: whether there is enough data in the community pool to redistribute, and how much data has already been donated to the student for the month.

To keep the maintenance and upkeep of the DataDonor system, MobileZA will take a 15% slice of all data donated. That means that should a user donate 20GB of their monthly data allocation, only 17GB will be made available for redistribution to students.

To ensure that all data is accounted for, a reporting system will allow customers to check how much data they have donated over time.

QUESTION 1: QUALITY CONCEPTS [15]
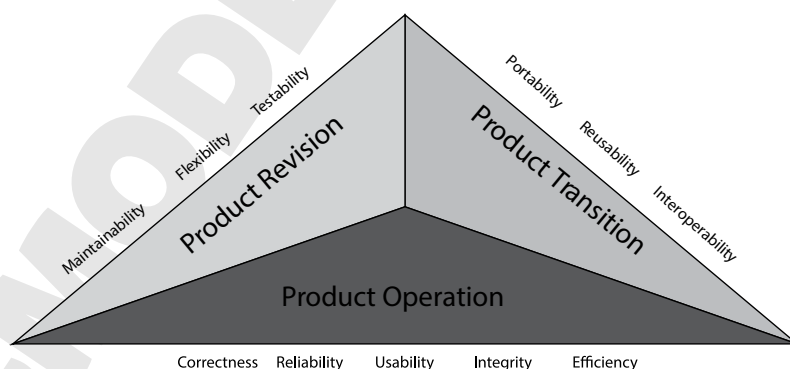
Consider McCall's software quality factors as seen in the triangle above. With reference to the features available to contract customers who may use the `DataDonor` app, discuss what you would consider to be indicators of quality in the software in terms of:

1.1.	Correctness.	(3)
1.2.	Usability.	(3)
1.3.	Integrity.	(3)
1.4.	Testability.	(3)
1.5.	Reusability.	(3)

QUESTION 2: CONDUCTING TECHNICAL REVIEWS [10]

DataDonor has finally been completed (23 100 lines of code later) and is about to be released for closed Beta testing. The 14-person MobileZA development team tasked with its design and development nominate five of their team members to form the formal technical review team. Each team member logs the following time spent on the preparation of the review.

Member	Person Hours	Major Errors	Minor Errors
Andrew	12	7	26
Ben	2.5	1	10
Carl	2	1	13
David	1.5	2	15
Enoch	3	1	13

The team meets up to discuss the review, which takes 4 hours because Andrew gets into a debate with the rest of his review team. The team finally agrees to go with Andrew's finding of 7 major errors and 26 minor errors. On average, each major error takes 8 hours to fix while each minor errors takes 3 hours to address.

2.1. Calculate the total review effort. Show your full working out. (5)

2.2. Comment on the effectiveness of the technical review. Advise how you would have it run the next time. (5)

QUESTION 3: SOFTWARE QUALITY ASSURANCE [15]

3.1. Explain why statistical quality assurance is seen to be a strategic approach to ironing out errors and defects in software. (5)

3.2. Identifying a potential (and reasonable) defect that may be present in DataDonor, describe the first four steps you would undertake if following the Six Sigma strategy reducing costs while improving quality. (10)

QUESTION 4: SOFTWARE TESTING [40]

4.1. Consider the following flowchart. Draw the corresponding flow graph to determine how many regions (and hence independent test paths) exist. (10)
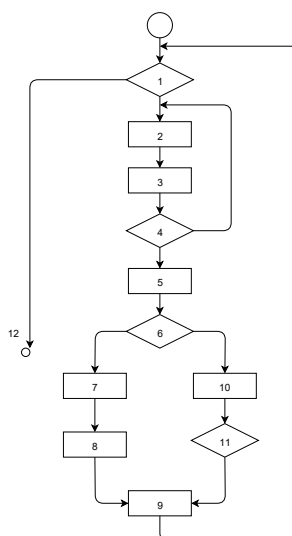
QUESTION 4: SOFTWARE TESTING (CONTINUED)

4.2. Discuss how you would set up a unit-test environment to test the units that make up `DataDonor`. (10)

4.3. Assuming that `DataDonor` comprises a number of classes that include `Donor`, `DonorAccount`, `Donation`, and `Student`. Using the information provided previously as well, discuss how integration testing will take place for `DataDonor`. (10)

4.4. Discuss the concept of security testing of `DataDonor` and suggest how this may be done properly. (10)

QUESTION 5: SOFTWARE CONFIGURATION MANAGEMENT [10]

5.1. Discuss how you will make use of e-Change Control to effect any change management for `DataDonor` effectively. (10)

QUESTION 6: SOFTWARE METRICS AND ANALYTICS [15]

Using Chidamber and Kemerer's OO software metrics, describe how the following design metrics will be used to assess DataDonor

6.1. Weighted methods per class. (3)

6.2. Depth of the inheritance tree. (3)

6.3. Number of children. (3)

6.4. Coupling between object classes. (3)

6.5. Lack of cohesion in methods. (3)

QUESTION 7: RISK MANAGEMENT [20]

7.1. Identify and briefly describe two potential risks relating to `DataDonor` that are relevant to two different categories of risk. (6)

7.2. For each risk identified in 7.1, assign a risk probability (as a percentage), and describe the perceived risk impact *(in rand value)* to calculate a risk exposure for each. Provide motivations for each of the values you assign. (6)

7.3. Choosing one of the risks you have identified, describe the mitigation, monitoring and management plan for that risk. (8)

QUESTION 8: LEGAL ELEMENTS OF SOFTWARE ENGINEERING [20]

☑ Yes! Send me promotion materials for specials!

8.1. Is the above an example of an Opt-in or Opt-out form? Motivate your answer. (4)

8.2. For each of the eight principles of the POPI Act, describe how you would ensure that they are correctly implemented for `DataDonor`. (16)

QUESTION 9: A STRATEGY FOR SOFTWARE SUPPORT [5]

9.1. Describe how you would make use of social media to proactively support `DataDonor`. (5)

THE END