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MARKSCHEME

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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY

Higher Level

Paper 3

Examiners should be aware that in some cases, candidates may take a different approach, which if appropriate should be rewarded. If in doubt, check with your Team Leader.

In the case of an "identify" question read all answers and mark positively up to the maximum marks. Disregard incorrect answers. In all other cases where a question asks for a certain number of facts *e.g.* "describe two kinds", mark the **first two** correct answers. This could include two descriptions, one description and one identification, or two identifications.

1. **(a)** **Define the term** *cookie*.   *[2 marks]*

A cookie is:
- information stored by your browser on your computer
- A small text file stored by the browser on the user's computer.

Award [1 mark] for either of the correct statements above.

A cookie also:
- contains information about a web site that has been visited
- contains name-value pairs of information, *e.g.* ID – id number
- can be linked to the web site's database that contains data about your visits, such as preferences, location, pages visited. Other information such as login information, last page visited, preferences to customize the web site such as colour, language
- is non-executable
- can have expiry dates or persist until deleted by the user
- can be encrypted for security and privacy reasons
- can be used to enhance a user's visit to a web site as information is stored that is used to customize the visit
- can help load a webpage quickly with your preferences from previous visits.

Award [1 mark] for further development about information contained in a cookie.

(b) **Describe how a cookie could enhance the experience of the user on the PTC web site.**   *[2 marks]*

The information stored in the cookie is used to enhance the user's next visits to the theatre web site by retrieving details of:
- which language was used in the last visit, which will avoid the necessity to select the desired language on the web site
- previous bookings and to present the current plays being performed at the last theatre visited, which is assumed to be the user's preferred theatre
- payment methods and personal details so they do not need to be entered again
- special needs, such as the address to send the tickets to as the user does not have the facility to print the tickets themselves
- the favourite genre of the user so that current and future plays of that genre can be suggested to the user
- the ID number so that the user does not need to remember it to receive these benefits.

Award [1 mark] for a general description or indirect enhancement of how recorded information can be used to customize the theatre booking experience for the user based on the previous visit to the web site, e.g. that an ID is used to retrieve the user's previous preferences.

Award [2 marks] for a description of a specific benefit, similar to those above, that clearly describes how the user's experience is enhanced. Only one enhancement is required.

2. **The database used by the PTC needs to conform to the ACID (atomicity, consistency, isolation and durability) rules.**

With reference to a customer making an online booking with the PTC for seats using a credit card, explain how the lack of conformity with *two* of the ACID rules affects the successful functioning of the PTC database booking system. *[6 marks]*

These rules are needed to ensure the reliability and integrity of the data stored in a database. The following transactions and problems are only samples of what could happen.

- **Atomicity**
  Rule – Atomicity means that a transaction is not finally accepted into the database until the processing of the data in the transaction is complete for all fields and the data has satisfied all the rules of the database. If any part fails due to problems with the data processing, the database system or the hardware, the transaction is rolled back.
  Problems – If one part of this transaction was not completed the database may contain a seat that has **not** been booked but has been paid for **or** a seat that has been booked but **not** paid for.

- **Consistency**
  Rule – There must be consistency between data fields in a record, as well as consistency of individual data in a particular field with the validation rules of the database.
  Problems – If some of the data entered by the user when paying for the seats is not valid then the whole transaction will be rejected, *e.g.* the credit card number is not a valid number, or the date is not a valid date. If this happens, the theatre will not receive the money for the seat or the buyer may not receive the tickets for the date wanted. Another type of consistency problem would occur if a patron decided to not subscribe to the theatre for that year. The record of the patron should be deleted and also any reference to the patron in the section of the database that is used to send out a newsletter each month; otherwise extra newsletters would be sent out causing a waste of time and money.

- **Isolation**
  Rule – Data cannot be accessed and used in other database operations until a transaction has been fully completed. Hence concurrent transactions on the same record in the database cannot be performed at the same time.
  Problems – If the transaction described above is not isolated from other transactions by marking/locking it in the process of being booked, then a double transaction for the same seat can occur. This could result in one person booking the seat and another person paying for it; **or** one person thinking that two seats have been booked but actually only one has been booked and paid for.

- **Durability**
  Rule – Durability is the guarantee that the data changes from a fully completed transaction will survive a failure of the system (hardware and software). A transaction log is one way that this can be achieved, or a real-time back-up can be used.
  Problems – If during the transaction there is a power surge, or some other equipment or software problem, the transaction may not be complete, *i.e.* all parts of the transaction have been entered into the database, checked and confirmed. This could result in the seat being booked but not paid for or *vice versa*; **or** the transaction not being processed at all, but a confirmation message being sent to say that it has been.

Two rules need to be identified and explained for the maximum [6 marks]. If only one is discussed the maximum that can be awarded for this question is [3 marks].

For each rule:
[1 mark]
The answer defines the rule.

[2–3 marks]
The answer identifies how the rule applies to a theatre database booking system and explains how the lack of conformity would affect the reliability and integrity of the data.

3. **Discuss the features of an appropriate user interface for the PTC online booking system that would create a quality experience for the user.** *[8 marks]*

List of features of the booking system web site that were highlighted in the case study:
- interactive selection of seats from a live theatre plan
- intuitive interface and structure – the student may discuss features here such as use of colour, spacing and alignment, titles, use of blocks of text, instructions
- users will be able to select preferred language from the four national languages, French, German, Romansh and Italian, and English, and if tourism increases, Russian and Arabic
- be compatible with all browsers – impact of lack of compatibility should be included in discussion
- secure online payment facility
- each theatre company needs a section for themselves
- an opening screen that integrates the main features of the web site – search, selection of theatres, current productions, future productions, *etc*.
- be able to switch from one language to another
- no need for additional software such as plug-ins and other client side software
- printing of tickets by users
- other payment systems for those who do not have a credit card
- special needs – for those who do not have easy access to computer equipment (through physical disability or some other reason), or may not be familiar with online booking systems
- use of video, animations and other multimedia features on the web site.

Other features may be added if appropriate.

In this question it is expected there will be a balance in the ITGS terminology between IT technical terminology and the terminology related to social and ethical impacts. For this question the answer will need to focus on the impact on the user as he/she uses the booking system to research productions, and to book and pay for tickets.

N.B. *Award no more than* ***[3 marks]*** *if no new information is added to that in the Case Study.*

SL and HL paper 1 part (c) and HL paper 3 question 3 markband

Marks	Level descriptor
No marks	• *A response with no knowledge or understanding of the relevant ITGS issues and concepts.* • *A response that includes no appropriate ITGS terminology.*
Basic **1–2 marks**	• *A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.* • *A response that includes minimal use of appropriate ITGS terminology.* • *A response that has no evidence of judgments and/or conclusions.* • *No reference is made to the scenario in the stimulus material in the response.* • *The response may be no more than a list.*
Adequate **3–4 marks**	• *A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.* • *A response that includes limited use of appropriate ITGS terminology.* • *A response that has evidence of conclusions and/or judgments that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.* • *Implicit references are made to the scenario in the stimulus material in the response.*
Competent **5–6 marks**	• *A response with knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately in places.* • *A response that includes conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.* • *Explicit references to the scenario in the stimulus material are made at places in the response.*
Proficient **7–8 marks**	• *A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately throughout.* • *A response that includes conclusions and/or judgments that are well supported and underpinned by a balanced analysis.* • *Explicit references are made appropriately to the scenario in the stimulus material throughout the response.*

4.   **The development of the IT system is due to start in June 2012 and be handed over on 1 March 2014. Formulate a development strategy that will enable the customized IT system to be delivered to the theatres that meets their requirements on time and within budget.** *[12 marks]*

*It should be recognized that, given time constraints, answers **are likely to include a much** narrower range of issues and concepts than identified below. There is no "correct" answer.*

*Examiners **must** be prepared to award full marks to answers which synthesize and evaluate even if they do not examine all the stimulus materials.*

The development strategy must address the following:
- the development and implementation of the IT system
- the requirements of the IT system
- the agreed time requirements
- the agreed budget requirements.

The case study provides the following requirements which should be addressed in the response:
- The theatres have a limited budget and are aware that the solution may require compromises in terms of features and functionality.
- Centralized web site for information about the venues, the productions, ticketing and seat selection:
  the web site has five languages
  - the web site has interactive seat selection
  - online payment facility
  - user friendly and includes consideration of customers with special needs, is compatible with many browsers and contains multimedia features (preferably with no plug-ins needed).
- Each theatre company needs to be able to manage its own part of the web site, and have access to sales and customer data for analysis and customer relationship management:
  - production of analysis reports, hopefully using business intelligence software
  - use of customer relationship management system software
  - the migration of data about current customers to the new system
  - using a content management system to manage the web site.
- The new system needs to be up and running by 1 March 2014.
- The choice of supplier, including the choice of the customization of an existing system or the development of a completely new system.
- Data integrity issues – security of data access and use, backup of data.
- The new system could be based on one of the two options listed below:
  - a distributed database system
  - a centralized database system, in association with a Virtual Private Network (VPN).

*The candidate must demonstrate an understanding of the **application** of the SDLC and Project Management in the context of the needs of the PTC – requirements, timeline and budget. The strategy should provide details of the developmental process to be followed and a justification of the process, including how the requirements above will be achieved.*

The response should refer to the ideas stated below, but may not address all within the time constraint.

Choice of development methodology
The candidate justifies the development methodology, Waterfall, Agile or a hybrid of both.
It is likely that the Waterfall method will be used and this may be inferred if the response shows a sequential development.
The length of time for each stage, assuming the Waterfall method is used, should be realistic.

Analysis stage
Performed by the PTC committee, or a sub-group, who need to engage the services of a systems analyst.
- **Data collection** *– e.g. questionnaires, interviews, observation, literature searches to provide analysis of current situation and organizational requirements.*
- **Identification of suitable system(s) is made** *– both customization of a product and development of a new system from the ground up.*
- **Identification of possible suppliers** *is made as well.*
- **Feasibility study***.*

*This report will need to go to the full PTC committee who will make the final decision. Customization of a product **or** development from the ground-up, a choice of supplier(s) is made and requirements specification documents are produced.*

Design stage
The supplier will take the requirements specification documents and develop a plan and a design that satisfies the requirements and the constraints imposed by the budget, timeline and the various features required.
- **Project plan** *(who, why, what, when and how) part of the project is developed by the systems analyst.*
- **Detailed designs are produced***.*
- **Choice of developmental strategy** *– e.g. waterfall, agile or a mixture of both – is also determined in the design stage.*
- **Acceptance of the plan***.*

The design is accepted by the full PTC committee and development starts.

Development stage
- **Development of the IT solution** *– choice of suppliers and developers of specialized parts of the system are selected, e.g. network and hardware suppliers, specialized database and web site developers, etc.*
- **Development of the web site** *– database and setting up of the hardware and software ready for comprehensive testing.*
- **Initial testing, alpha testing** *– would most likely take place in the premises of the supplier and must satisfy the requirements specified.*

Implementation stage

- ***Training and support*** *of staff, documentation to support the new IT system.*
- ***Changeover methods****.*
- ***Beta testing*** *– the testing of the system in situ at the theatres which should utilize the staff as well. It would need to be thorough and include all areas of operation, including data security, backups and disaster recovery plans. Beta testing would also include the use of "real data" migrated from the records of previous performances and productions in the two theatres.*
- ***Maintenance*** *– maintenance contracts should have been part of the original negotiations.*

HL paper 3 question 4 markband

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Basic **1–3 marks**	• *A response with minimal knowledge and understanding of the relevant ITGS issues and concepts.* • *A response that includes minimal use of appropriate ITGS terminology.* • *A response that has no evidence of judgments, conclusions or future strategies.* • *No reference is made to the information in the case study or independent research in the response.* • *The response may be no more than a list.*
Adequate **4–6 marks**	• *A descriptive response with limited knowledge and/or understanding of the relevant ITGS issues and/or concepts.* • *A response that includes limited use of appropriate ITGS terminology.* • *A response that has evidence of conclusions, judgments or future strategies that are no more than unsubstantiated statements. The analysis underpinning them may also be partial or unbalanced.* • *Implicit references are made to the information in the case study or independent research in the response.*
Competent **7–9 marks**	• *A response with knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately in places.* • *A response that includes **future strategies**, conclusions and/or judgments that have limited support and are underpinned by a balanced analysis.* • *Explicit references to the information in the case study or independent research are made at places in the response.*
Proficient **10–12 marks**	• *A response with a detailed knowledge and understanding of the relevant ITGS issues and/or concepts.* • *A response that uses ITGS terminology appropriately throughout.* • *A response that includes conclusions, judgments or **future strategies** that are well supported and underpinned by a balanced analysis.* • *Explicit references are made appropriately to the information in the case study and independent research throughout the response.*