



**Asian Institute of Technology**  
**Mid-semester Examination**  
**August 2019**

Course: AT71.9003 Selected Topic: Data Management & Modeling	Total score: 100 (20 %)
Date: Thursday 20 September 2019	Time: 13:15-15:15 (2 hours)

**Exam Instructions**

- This examination is Open-Book. Number of pages: 3, Number of Questions: 5.
- Be concise!
- **Refer to Case Study I to answer Questions 1 to 5. For any missing details, explicitly state necessary assumptions or conditions you make. Make your assumptions rational and practical.**

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**Exam Questions**

1. (15 points) Analyze any problems that could arise if RPMO continues to maintain its data in the current manner. Give examples to support your explanation.
2. (15 points) Analyze the characteristics and requirements of data in RPMO. Discuss the role of data modeling and management and how it can support operations and decision making in RPMO. Give specific examples of operations or decisions. Recommend appropriate data model and management techniques/tools to meet the analyzed requirements.
3. (40 points) Design an ER or EER Diagram that can best model the given case study. Then, map the resulting ER diagram into a corresponding relational schema diagram.
4. (20 points) Identify two most interesting queries of RPMO Database. Write corresponding SQL statements for the identified queries.
5. (10 points) After the database system has been used for six months, the system becomes much slower. Assume that the queries identified in the previous question are the most frequent ones. Suggest practical techniques to improve the system performance.

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**Case Study I:** Research is a significant activity in most universities, and is regarded as an important performance index of university faculty and staff. To support this key activity, Research Project Management Office (RPMO) of Kookle University is responsible for maintaining data about research projects, grants received, donors, faculty, staff and students working on projects, etc. For simplicity purpose, RPMO staff simply uses spreadsheets to record, track and manage project related-data. When a project is initiated at the university, a faculty member who is the project invigilator must officially submit a completed project form to RPMO. The staff of RPMO then records the project data in a few corresponding spreadsheets for further tracking, planning and forecasting. Apart from entering and updating data about each project, RPMO staff often needs to query the data from the project spreadsheets and coordinate with the project investigator as well as generate useful reports or statistics for the university management: total grants received for each active and key research areas of each year, important statistics about the project sponsors/donors, research performance of each faculty/staff, etc.

Example of a completed form as well as a project spreadsheet are given in the next pages.

**Kookle University**  
**Project Initiation Form**

Date: 1 Jan 2019

Project Title: Ontology-based Plant Disease Detection System

Project Description: The project aims to ...

Keywords: Ontology, Plant Disease, Intelligent System

Project Category: ☒ Research and Development  
☐ Training/Capacity Building  
☐ Conference/Workshop

Research Areas of the Project: Semantic Web, Ontology, Knowledge Representation

Project Duration: 12 months

Contract Period: 1 Jan 2019 – 31 Dec 2019

Budget: 1,000,000 THB

Installment:

No.	Date	%Budget	Amount
1	30 April 2019	30	300,000
2	31 August 2019	30	300,000
3	31 December 2019	40	400,000

Principle Investigator:

1. Name: Mark Zuckerberg Email: mark@kmail.com  
Department ICT Department Area of Expertise: Social Analytics, AI  
2. Name: Elon Musk Email: musk@kmail.com  
Department ICT Department Area of Expertise: Knowledge Representation

Project Member:

1. Name: Tim Berners Lee Email: tim@kmail.com  
Department ICT Department Area of Expertise: Semantic Web Ontology  
2. Name: \_\_\_\_\_ Email: \_\_\_\_\_  
Department \_\_\_\_\_ Area of Expertise: \_\_\_\_\_

Donor/Sponsor Name: Thailand Research Fund

Donor Type: ☒ Research Organization  
☐ International Organization  
☐ Private Company

Donor Contact Info: Mr. Somchai N. CMMU Building Phayathai Bangkok 10400 Thailand  
Tel: (+66) 2 343 1500

Student Assistant:

1. Name: Nina Billa Email: nina@kmail.com  
Department: ICT  
Responsibility: Programming  
Maximum working hours per month: 40 Rate per hour: 300  
Start Date: 1 Feb 2019 End date: 30 June 2019  
2. Name: Lucy Dell Email: lucy@kmail.com  
Department: Business Management  
Responsibility: Project Coordinator  
Maximum working hours per month: 40 Rate per hour: 300  
Start Date: 1 Jan 2019 End date: 31 Dec 2019

**(Part of) Project Sheet**

Project ID	Project Title	Donor	Donor Type	Donor Contact Info	Project Investigator	Project Members	Department	Contract Period	Status	Description	Research Areas	Project Amount
SET-R001	Cross Layer Design for Video Transmission in Multi Hop wireless Networks	Thailand Research Fund	Research Organisation	Mr. Somchai N. CMMU Building Phayathai Bangkok 10400 Thailand Tel: (+66) 2 343 1500	Bill Gates (gates@kmail.com)	Tim Berners Lee (tim@kmail.com), Ted Codd	ICT Department	01/01/19 - 30/06/19	Completed	NA	Telecommunication, Wireless Network	991,200
SET-R002	Road Safety Engineering Training	Viet Land Company	Private Company	39 Bangkok 10200 Thailand Tel: (+66) 2 343 1599	Mark Zuckerberg (mark@kmail.com)	Ted Codd, Linus Torvalds	Civil Engineering Department	01/01/19 - 31/12/19	On-going	To conduct the road safety training for Vietnamese delegates	Transportation, Road Safety Management	850,000
SET-R003	Ontology-based Plant Disease Detection	Thailand Research Fund	Research Organisation	Mr. Somchai N. CMMU Building Phayathai Bangkok 10400 Thailand Tel: (+66) 2 343 1500	Mark Zuckerberg (mark@kmail.com) Elon Musk (musk@kmail.com)	Tim Berners Lee (tim@kmail.com)	ICT Department	01/01/19 - 31/12/19	Closed (31/08/19)	NA	Semantic Web, Ontology, Knowledge Representation	65,000
SET-R004	The 10 <sup>th</sup> Grand Thailand Robotics Competition	USAID	International Organisation	39 Bangkok 10200 Thailand Tel: (+66) 2 343 1599	Tim Berners Lee (tim@kmail.com)	Mark Zuckerberg	ICT Department	01/01/19 - 31/06/19	Extended (31/06/20)	NA	Machine Vision, Robotics	900,000
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