UNIVERSITY
OF
JOHANNESBURG

PROGRAM	:	B TECH *ENGINEERING INDUSTRIAL*
SUBJECT	:	**SYSTEM DYNAMICS**
CODE	:	**TSH 421**
DATE	:	SUMMER EXAMINATION 2017 18 NOVEMBER 2017
DURATION	:	SESSION 2: (12:30-15:30)
WEIGHT	:	40: 60
TOTAL MARKS	:	100

ASSESSOR	:	MR. B. MOGOTSI	
MODERATOR	:	Ms. N.I. DLUDHLU	2434
NUMBER OF PAGES	:	4 PAGES	

REQUIREMENTS	:	COMPUTER LAB WITH ARENA SOFTWARE

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INSTRUCTIONS TO STUDENTS

PLEASE ANSWER ALL QUESTIONS.

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SECTION A: SYSTEMS DYNAMICS THEORY

QUESTION 1

You have been assigned to conduct simulation modeling for the new strategic initiative in your company. Explain to the sales team what is simulation? Taking into account the following:

1.1.	Definition of simulation.	(1 marks)
1.2.	Difference between physical and logical modeling.	(6 marks)
1.3.	Reasons why we do simulation?	(13 marks)

[Total Marks 20]

QUESTION 2

A task with an original planned duration of twelve days assuming a four-person crew working eight hours per day. If it was necessary to reduce this duration by four days down to eight days, one might assume that it would be necessary merely to require the four-person crew to work twelve-hour days. It is unlikely, however, that increasing resources will result in a proportional reduction in duration. Requiring substantial overtime will fatigue the workers, which will result in decreased productivity, which will result in a non-linear reduction in task duration.

Similarly, fatigue may result in poor quality, which will necessitate rework, which will also result in a non-linear reduction in task duration. In short, the task would likely not be completed in eight days as assumed.

Design a causal loop diagram showing the variables mentioned above also what the diagram means.

[Total Marks 15]

QUESTION 3

System dynamics (SD) is an approach to understanding the structure, feedback mechanism and behavior of complex system. It is a radical approach to enhance cross sectorial and organization communication and collaboration to ensure that solution are found at the level of the root causes. Generally there are five main steps within the SD approach.
Name and discuss this main steps.

[Total Marks 20]

INSTRUCTION: Students are expected to save their ARENA model in a compressed zipped folder labelled with their Student Number and Surname. The compressed zipped folder must be saved in C: / Lan School Files (C Drive).

QUESTION 5

The company you working for specializes in simulation models. Liquid Fine Petroleum Group LTD PTY approached your company on a consulting base to develop a simulation model for their car wash model. Later to develop a petrol station layout.

The premises of the business will be set up as follows:
- 3 wash bays
- 400 m/sq
- 6 drying areas
- Fully furnished offices
- CCTV Cameras
- Drains, compressors will be installed
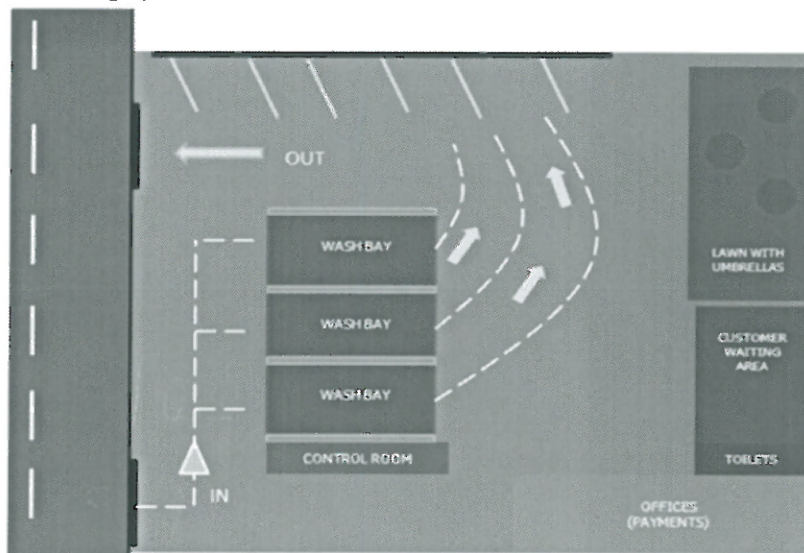- Fingerprint staff pay and attendance

Figure 1. Liquid Petroleum Car was structure

Based on the research done by your company on town vehicle stats, the statistics shows the following: Vehicles will arrive with approximately Expo (9) interval times (all times are in minutes) to get washing on either bay 1, 2, 3 respectively. If there is a wash bay the Vehicle proceeds immediately to that wash bay. It will take approximately 1 min to travel to wash bay. If there is more than one empty wash bay, the vehicle places preference on the higher numbered wash bay (3, 2, 1). If all the wash bay are busy, it chooses the wash bay with minimum number of waiting time. If there is a tie, it places preference on the lowest number of dock (1, 2, 3).

The wash time at Wash bay 1 is sitting at tria(25,28,30), Wash bay 2 tria(23,26,28) and wash bay 3 tria(22,25,27)

Develop a simulation model with modules from the Advanced Process panel using required module from the basic process panel to implement the selection logic. Run your model for 20 000 minutes and collect statistics on wash bay utilization, number in queue, time in queue, and the time in the system.

[Total Marks 45

TOTAL = 100