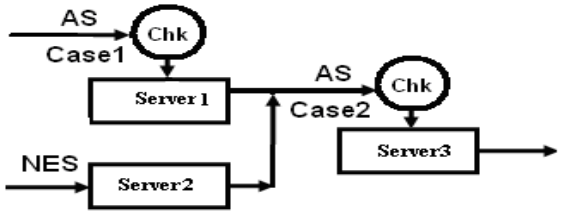
Philadelphia University **Faculty of Information Technology**
Lecturer: Dr. Nameer N. EL-Emam **Department of CS**
Internal Examiner: Dr. Raad Alwan **marking Scheme**
Coordinator: Dr. Nameer N. EL-Emam
Module Name: Simulation and Modelling First Exam Semester one of academic year: 2014-2015
Module Number: 750472 Date: 27/11/2014 Time: one hour

1. Discrete Simulation:

Objective: This part aims to test the ability of students to use discrete simulation method of solution for any type of problem that includes single or multi server(s) and single or multi queue(s). In addition, students must display the behavior of a simulation system through the time analysis/timetable and show the proposal decision.

Q1/(12 marks)

Assume that we have the following hybrid system network which includes two layers.

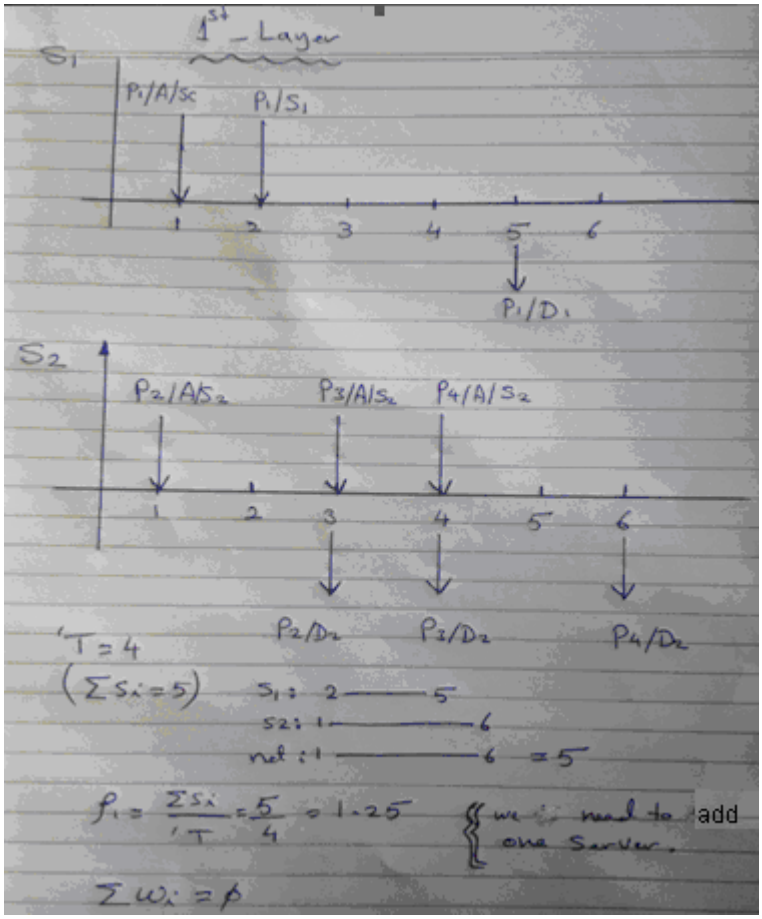


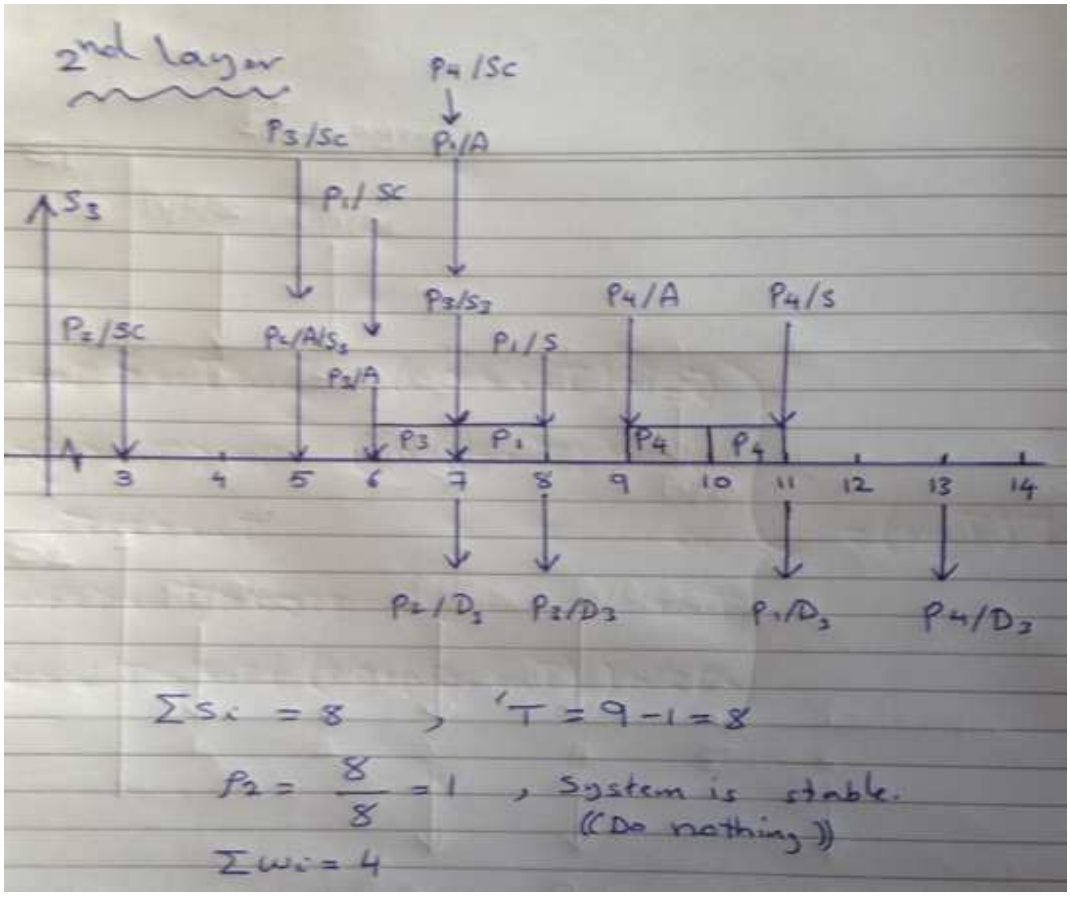
Perform **Next Event Scheduling (NES)** simulation technique on servers **(2)** and using **Activity Scanning (AS)** simulation technique on servers **(1, 3).** Let us define the following timetable to find **total waiting time and utilization at each level.**

Process No.	Inter-arrival Time	Service Time at any Server	Check Time
1	1	3	1
2	0	2	2
3	2	1	1
4	1	2	2

Answer the following requirements ***(3-marks for each):***

1- Find *time analysis*, for each layer.
2- Find utilizations and total waiting time for each layer.
3- Draw your conclusion for each layer.


1st Layer
S1
P1/A/Sc
P1/S1
1
2
3
4
5
6
P1/D1
S2
P2/A/S2
P3/A/S2
P4/A/S2
1
2
3
4
5
6
P2/D2
P3/D2
P4/D2
T = 4
(Σsi = 5)
S1: 2 —— 5
S2: 1 —— 6
net: 1 —— 6 = 5
ρ1 = Σsi / T = 5/4 = 1.25
we need to add one server.
Σ wi = p

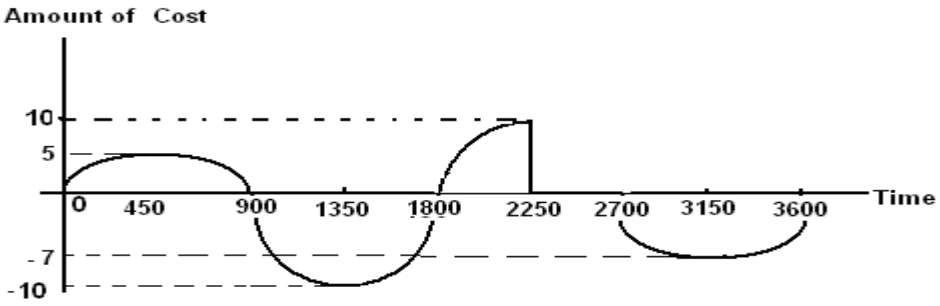


2. Model development

Objective: This part aims to test the student's skills in the field of model analysis and model development. It means that it is important to convert any model into suitable form that satisfies the main concepts of phenomenon through verification and validation.

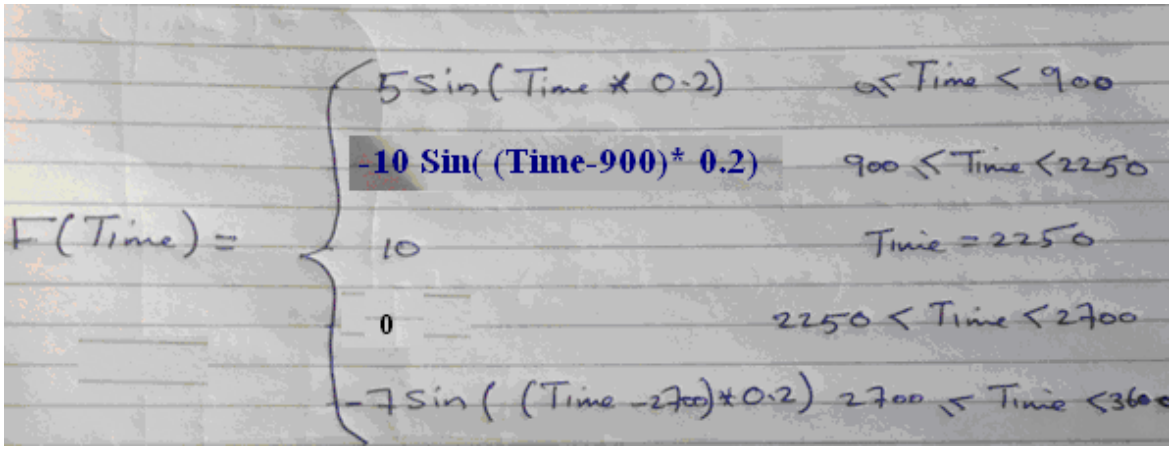
Q2(8marks)

Assume that we have the following continuous function for the commercial project.



Answer the following *(3 marks for each*)

1- Build mathematical model to describe and imitate the above system behavior.



2- Write suitable algorithm to check validation of the model.

Induction Algorithm

Step1: Find massing data from observations.
Step2: Formulate hypothesis to fit all data (from particular to general).
Step3: if all data are matching with model based on hypothesis then
Model is valid
Otherwise
Model is invalid

Validation:
Select mass of data (900, 1350, 3150,….)
Using induction algorithm to prove the model validation for three of observation

- **for time=900 then F(900)=-10*sin((900-900)*0.2)= 0**

Then it is matching with the real system

- **for time=1350 then F(1350)=-10*sin((1350-900)*0.2)= -10**

Then it is matching with the real system

- **for time =3150 then F(3150)=-7*sin((3150-2700)*0.2)=-7**

Then it is matching with the real system