The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Electrical and Computer Engineering

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Study Program	: Bachelor of Software Engineering in Honours
Name of the Examination	: Final Examination
Course Code and Title	: **EEX5362 Performance Modelling**
Academic Year	: 2023/24
Date	: 17th August 2024
Time	: 01:30 – 04:30 hrs.
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. Answer all questions
3. Answer for each question should commence from a new page.
4. This is a Closed Book Test (CBT).
5. Answers should be in clear handwriting.
6. Do not use a red pen.
7. Clearly state your assumptions, if any.

Question 1 [25 Marks]

A. Assume that a business receives an average of 12 calls per day.

I. What is the probability that it will get exact 8 calls in one day? [5 Marks]

II. What is the probability of getting at most 5 calls per day? [5 Marks]

III. What is the probability of getting more than 6 calls per day? [5 Marks]

B. A newly developed device has a mean time to failure of 50 hours.

I. Calculate the probability that a device lasts more than 75 hours before failing. [5 Marks]

II. Calculate the probability that a device fails within the first 100 hours. [5 Marks]

Question 2 [25 Marks]

A. Explain what you mean by 'Performance testing.' [2 Marks]

B. Name two parameters/functions that should be monitored in the test application while running a performance test. [2 Marks]

C. Name three performance testing tools. [3 Marks]

D. Name three items that should be included in the performance test results. [3 Marks]

E. Explain the purpose of conducting a Proof of Concept (POC) activity before starting a performance test engagement. [5 Marks]

F. Compare and contrast load testing and stress testing. [5 Marks]

G. Suppose you join a startup company as the only software tester. The business owner requests **not to** perform any performance testing due to time limitations. As a newly appointed software tester, what would you do? Clearly explain. [5 Marks]

Question 3 [25 Marks]

A. Consider a single-server queue (M/M/1). Assume customers arrive according to a Poisson process at a rate of 5 customers per hour. Further, the service times are exponentially distributed with an average service rate of 6 customers per hour.

I. Calculate the average time a customer spends in the system. [5 Marks]

II. Calculate the probability that the server is idle. [5 Marks]

B. Consider the same queue mentioned above, where customers arrive according to a Poisson process at a rate of 4 customers per hour, and the service times are exponentially distributed with an average service rate of 5 customers per hour:

I. Calculate the probability that there are exactly 3 customers in the system. [5 Marks]

II. Calculate the expected number of customers in the queue (not in the system). [5 Marks]

III. Calculate the average time a customer spends waiting in the queue before being served. [5 Marks]

Question 4 [25 Marks]

A. A call center receives phone calls according to a Poisson process with an average rate of 12 calls per hour. Each call requires service time that follows an exponential distribution with a mean of 5 minutes. The call center has 4 agents available to handle the calls.

I. Determine the average number of calls in the system (both waiting and being serviced). [5 Marks]

II. Calculate the average time a call spends in the system (from arrival to completion). [5 marks]

III. Calculate the average number of calls waiting in the queue. [5 Marks]

B. A software company is developing a new software solution which is expected to handle user requests/API calls through a web server. Based on initial estimates, the application is projected to receive 1,000 concurrent users/API calls during peak hours. Each user is expected to generate an average of 5 requests per minute. The average time to process each request is 0.2 minutes. The company needs to determine the following:

I. Calculate the required number of web servers to handle the peak load efficiently with the justification. [5 Marks]

II. Calculate the total network bandwidth needed to accommodate the peak load. [5 Marks]

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