



**TECHNICAL UNIVERSITY OF MOMBASA**  
***Faculty of Business & Social Studies***  
DEPARTMENT OF BUSINESS STUDIES

UNIVERSITY EXAMINATIONS FOR  
MASTERS IN BUSINESS ADMINISTRATION

**BMS 5204: BUSINESS MODELING AND SIMULATION**

END OF SEMESTER EXAMINATIONS

**SERIES:** APRIL 2015

**TIME:** 3 HOURS

**INSTRUCTIONS:**

- Attempt question **ONE (Compulsory)** and any other **THREE** questions
- Do not write on the question paper.

*This paper consists of Four printed pages*

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**QUESTION 1 (Compulsory)**

A typical decision in a factory environment that requires some treatment of statistical certainty is the purchase of equipment. Machines from different manufacturers or models will have different properties. Some machines will produce more scrap. Some take longer to repair than others. Some will breakdown more frequently.

A continual headache in the factory is machine X. It is the bottleneck in the process. If it is fully operational and producing good material, it is capable of meeting the demand. However, demand is not being met and something needs to be done.

Unfortunately, the machine seems to be plagued with problems. It is not entirely reliable and produces a certain quantity of scrap. Adding another machine would seem a clear choice but is not a possibly

because of space limitations. The only other choice appears to be replacing this machine with one that is more reliable.

By talking with sales associates from various companies, a replacement machine that is claimed to satisfy the plant's needs is found. Fortunately, there is the opportunity to verify the manufacturer's claim. Another facility in the organization uses this machine and has been keeping detailed maintenance logs.

A simple simulation model was built to illustrate the statistical analysis of this problem. On the top is the line set-up to run as the manufacturer claims. The second line uses probability of breakdown, repair time and scrap numbers from the other facility.

The last line is the current line operating in the factory.

**Required:**

- a) Does the simulation support the manufacturer's claim? **(4 marks)**
- b) After 10 trials is there conclusive evidence that machine from the other facility is significantly better than the current machine? What about after 40 trials. **(6 marks)**
- c) What would the new machine be worth to the organization? What additional features could influence your decision? **(8 marks)**
- d) Describe a different problem in which the statistical validity of the simulation could be a critical feature. **(7 marks)**

**QUESTION 2**

- a) What is computer simulation? **(2 marks)**
- b) Discuss the advantages and disadvantages of simulation. **(14 marks)**
- c) Differentiate the following kind of simulation:
  - i) Static Vs Dynamic
  - ii) Continuous change Vs Discrete change
  - iii) Deterministic Vs Stochastic **(9 marks)**

### QUESTION 3

- a) Define the following terms in the context of modeling and simulation:
- i) Verification
  - ii) Validation
  - iii) Credibility **(6 marks)**
- b) Can simulation model be verified but not valid and vice-versa? Investigate your answer with an example of each. **(4 marks)**
- c) Discuss **FIVE** techniques for verification of simulation computer programs. **(5 marks)**
- d) Discuss **FIVE** techniques for increasing model validity and credibility. **(5 marks)**
- e) List **FIVE** major pitfalls in simulation modelling. **(5 marks)**

### QUESTION 4

- a) Discuss the steps of constructing a simulation model stating clearly what happens at each step. **(14 marks)**
- b) What is Monk Carlo simulation? **(3 marks)**
- c) Explain the term random variant. **(3 marks)**
- d) Explain **FIVE** application areas of simulation and modelling. **(5 marks)**

### QUESTION 5

Draw an activity cycle diagram for each of the following case:

- a) A repairman responsible for the repair of a grinding machine on whenever it breaks down. Breakdown occur intermittently terminating a period during which the machine is running normally. **(3 marks)**
- b) The repairman of (a) is also made responsible for the repair of drilling machine which also breaks down after a period during which it is running normally. **(5 marks)**
- c) A machine shop has 20 different machines each of which is subject to occasional breakdown when a machine breaks down it must be isolated from the main power supply by a qualified electrician. The machine is then transported to the repair shop by a gang of labourers and is repaired by a mechanic. When the repair is complete the process is reversed and the machines set running again. **(7 marks)**

- d) Patients arrive intermittently at the Accident and Emergency Department (AED) of a local hospital. After giving details to a receptionist, they wait to be seen by one of the five doctors on duty. Patients are always examined in one of the ten cubicles provided. Sometimes the doctor send a patient to the x-ray department after which patients return to AED with their X-ray for diagnosis and treatment. Some patients not requiring x-ray are treated immediately after the first examination. Others are admitted to hospital as in-patient when a bed is found for them. Patients waiting for admission as in inpatient remain in their cubicles until a bed is found. **(10 marks)**

### QUESTION 6

- a) What is a model? Give **THREE** reasons why we build and experiment with models. **(7 marks)**
- b) Describe capacity planning. What are the inputs to the process and what are the outputs. **(8 marks)**  
(Hint: A diagram might be helpful)
- c) What is a system? Give a short format definition. **(2 marks)**
- d) What are the **FOUR** possible ways to study a system? **(8 marks)**