

**KENYA METHODIST UNIVERSITY**

**End of Trimester 1 Examinations, April 2008**

**Faculty : Science and Social Studies**  
**Department : Computer and Information Science**  
**Course Code : COMP 301**  
**Course Title : Computer Architecture**  
**Time : 2 hours**

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**Instructions: Answer question one and ANY OTHER TWO questions**

**Question 1 (30 marks)**

- a) Describe the components of the *instruction cycle*. In this context, explain with justification the idea of interrupts and how interrupts are supported. (3 marks)
- b) Explain the SIX layers found in the modern multilayered system architecture. (3 marks)
- c) Bus lines are grouped depending on function, State and explain the three bus signal groups. (3 marks)
- d) Explain Two main characteristics of the following types of semiconductor Technology
  - (i) BJT technology:
  - (ii) MOSFET technology (4 marks)
- e) Define peripheral devices, Explain the three broad Classifications of peripheral devices (5 marks)
- f) Describe three Configuration approaches for I/O module in computer systems architecture. (3 marks)
- g) Explain the mechanism behind the functionality of the hard disk. Outline the main hard disk roles in relevance to computer architecture. (6 marks)
- h) Describe the internal function of the CPU, Describe the classical components that make up the Processor architecture. (3 marks)

**Question 2 (20 marks)**

- a) Memory references tend to be clustered in certain regions in within the computer system. This feature is known as the principle of locality, and it occurs in three dimensions. State and explain these dimensional factors on the principle of locality. (6 marks)
- b) The memory type known as EEPROM or Flash ROM has found application in main memory subsystem, I/O subsystem and mass storage subsystem. Explain four basic characteristics of flash ROM. (4 marks)
- c) Describe the memory performance enhancement known as *burst access mode*. Provide a convincing argument by providing a relevant example that its use does indeed results in memory performance enhancement. What is the most important factor to consider in regard to timing (6 marks)

- d) In the context of a memory subsystems employing caching, explain the term replacement policy highlighting its effect on cached memory performance. Explain why LRU is considered the preferred replacement policy but also comment on its implementation challenges. (4 marks)

**Question 3 (20 marks)**

- a) Using the standard parallel interface adapter as an example, describe the general organization, including the programming model, of an I/O device interface adapter. (10 marks)
- b) Explain the role of the hard disk storage system in computer system performance and reliability. Describe how the RAID technology may be used for enhancement of reliability, performance or both. (6 marks)
- c) Explain the benefits of using the SCSI disk interface system (as compared to IDE/ATA) for PC-based server systems. (4 marks)

**Question 4 (20 marks)**

- a) Using an appropriate illustrative diagram, outline the *classical internal organization* of the CPU. Explain the *instruction cycle* and the roles of PC, IR, MAR and MBR registers (8 marks)
- b) Describe the distinguishing characteristics of the following memory types and further, explain with justification their possible areas of application (within a typical computer system). Memory types: Conventional DRAM, Fast Page Mode (FPM) DRAM, Extended Data Out (EDO) DRAM, Synchronous DRAM (SDRAM), Double Data Rate (DDR) SDRAM, Rambus DRAM (RDRAM). (12 marks)

**Question 5 (20 marks)**

- a) In the context of a memory subsystem employing caching, explain the term placement policy and replacement policy highlighting their effects on cached memory performance, cache hit and cache miss, Missed penalty, cache write through and delayed update (12 marks)
- b) Write brief comparative notes on the MIMD computer architectures known as SMP, Cluster and NUMA respectively. (8 marks)