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## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, M. Tech – VLSI Design and Embedded System (MECE)

Semester End Examination; Jan - 2017

SOC Design

Time: 3 hrs

Max. Marks: 100

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

### UNIT - I

- 1 a. Define the SOC. Explain various factors that are driving the industry to develop SOC. 6
- b. What are important specifications of SOC design process? Explain types of SOC specification. 8
- c. Outline the SOC design flow procedure. 6
- 2 a. Explain Moore's law and its different interpretations. 6
- b. Compare SOC, SIP and SOB on different characteristics. 8
- c. What are the characteristics of a good IP? Explain. 6

### UNIT - II

- 3 a. Write at least six major differences between RISC and CISC processors. 6
- b. Describe Van-Newman and Harvard architecture. 8
- c. Compare micro controller DSP and their selection criteria. 6
- 4 a. What is cache coherency? Explain MESI protocol for cache coherency. 8
- b. Explain working of NAND Flash memory with a neat diagram. 6
- c. Describe basic DRAM with its architecture and also its variations to enhance the speed with necessary timing diagram. 6

### UNIT - III

- 5 a. Why hardware accelerators are needed in SOC? Mention their typical applications. 8
- b. What are the types of data transfer modes? Explain each type with advantages and drawbacks. 12
- 6 a. What is network on chip? Explain direct, indirect and Hybrid topologies with a neat diagram. 10
- b. Explain worm hole switching. 5
- c. Describe bus architecture and its limitations. 5

### UNIT - IV

- 7 a. What is the resolution of 13 bit A/D converter? If the converter has a full scale output of 10V. What is the size of each step? What will be the actual maximum output voltage if this converter has to be consistent with its resolution? 8
- b. Describe the main advantages of instrumentation amplifier over single differential amplifier. 4

- c. An RF signal has spectral band centered around  $\omega_{RF}$  rad/sec. The local oscillator frequency is  $\omega_{LO} < \omega_{RF}$ . Give the block diagram of Hartley image rejection receiver. Show by analysis. How the image band is rejected? 8
- 8 a. What is the need for power management circuits in SOC? What are the sources of power dissipation? 8
- b. Explain the operation of RF transmitter and receiver circuits with relevant diagrams in detail. 8
- c. Write short notes on amplifier need in SOC design. 4

**UNIT - V**

- 9 a. With neat flow chart, Explain high level verifications for SOC devices. 10
- b. Discuss the issues in Hardware software code sign. 10
10. Write short notes on the following :
- i) ESL design flow
  - ii) USB controller 20
  - iii) Hard and soft IP
  - iv) Packaging problem in SOC.

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