

**BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI**  
**I SEMESTER 2016-2017**  
**EEE G512 EMBEDDED SYSTEMS DESIGN**  
**COMPREHENSIVE EXAM (OPEN BOOK)**

**M.M. 90**

**DATE 01-12-2016**

**DURATION - 3 Hours**

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- Write to the point answers.
  - All the schematics must be drawn clearly with all the connections properly named.
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**Q. 1** Design a system for recording and display of response time of participants in a quiz competition. (Think of fastest finger first in KBC). There are total 8 participants in the quiz and total time of 60 seconds is given to them to register their answer after the question flashes on the screen. A buzzer will sound at the beginning and end of the 60 seconds interval. Participant with correct answer and fastest response time will be declared as the winner of that particular question. System should be able to record the response time of each participant accurate to the 100<sup>th</sup> of a second, it should also display if the answer given by any participant was correct or not and list the result in ascending order of response time. Every participant has 4 push buttons in front of him/her to register the correct answer out of 4 given options. Latest answer during the 60 second interval should get registered in the system and ties between one or more participants must be taken care of.

**You are asked to design this system with minimal resources to reduce the cost wherever possible. So think of cheaper alternative to every design aspect without compromising the functional reliability of the system. Most efficient design with low cost components will fetch more marks.**

**Answer following questions**

1. Considering that you are solely responsible to develop this system for commercial usage, do you find yourself able enough to reliably design this kind of system from scratch, if not, which part of your design will require help from others? Justify your answer? **[2]**
2. Do you require any programmable device to design this system? If yes, which device would you choose to design this system; considering cost, availability and time to market? **[3]**
3. What kind of display would you choose, considering an audience of 50-100 people, briefly explain the working of your display, you may choose any suitable off the shelf display? **[5]**
4. Propose a functional and practical solution to above design statement and draw its block level abstraction, explain each block in brief. **[15]**
5. How does your system detect if the answer given by the participant is correct or incorrect? **[10]**
6. How do you propose to measure the response time? How will you make sure that it is accurate to the 100th of a second? Which peripheral (internal or external) will be used for this as per your proposed design? **[10]**
7. Draw the schematic diagram of your proposed solution, indicate exact part number wherever possible or else just give the symbol/ functional need of the component used. **[10]**
8. Write a function level abstraction of C code for all the programmable devices in your system, if any. You may assume that you already have code library for display driver. **[10]**

**Q2.** Give a design outline for a portable system of cashless payment that can take user's data input and send those values to a centralized data centre. For example a system to enter small set of data items consisting of both numeric and alphanumeric values say AADHAAR number, PAN card number, Transaction amount and send that data to a remote data centre in a secure manner in real time without failure.

- What kind of user interface device will be suitable for this kind of system? Considering the system demands quick response time and easy to use without any prior training. **[5]**
  - Give a block level design for such system? **[10]**
  - Which network interface protocol will be suitable for such system, why? **[5]**
  - How will you ensure that the data is secure while sending it on the network? **[5]**
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