P947

[3664]-212
B.E. (Electronics)
ELECTRONIC PRODUCT DESIGN   Sem-2
(2003 Course)

Time : 3 Hours]						*[Max. Marks : 100*

Instructions to the candidates:
1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of electronic pocket calculator is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are different components of product's selling price? Draw schematic block diagram of a Laboratory Function Generator. Assume reasonable raw material and derive selling price using above components.
					[10]

b) Draw a sketch of front panel of a Laboratory Function Generator and explain how ergonomic and aesthetic design considerations are taken care of in the same.					**[8]**

OR

Q2) a) Explain the mechanism of generation of :			**[6]**
   i)   Conducted EMI.
   ii) Radiated EMI.

b) For following situations, suggest suitable suppression device / component / mechanism and also explain how it is effective in suppressing the EMI :
   i)   The power transformer in a PID controller fails due to 1800V transient measured on AC mains when a nearby DC Motor is switched OFF.
   ii) When there is a call on mobile phone of a person operating PC, the monitor screen looses synchronization.
   iii) In a multi-PCB industrial DC drive housed in 19" rack, the CPU is reset whenever driver circuit in one of the cards switches on four or more Electromagnetic relays.					**[12]**

Q3) A mixed signal system on single PCB houses following sub-circuits :

    a)   Power supply for Analog circuits.

    b)   Power supply for Digital circuits.

    c)   Analog signal conditioning circuit.

    d)   ADC.

    e)   Microcontroller.

    f)   Digital I/O.

    g)   Clock for digital circuits and Microcontroller.

Discuss in details the recommended PCB design practices for each of the above sub-circuits and draw a sketch indicating relative placement of sub-circuits. Justify your recommendations regarding relative placement. **[16]**

OR

Q4) a)   For a 70-micron copper clad laminate, what will be the value of resistance of a 2.0 mm wide track that is 16 cm long? Assume resistivity of copper to be 1.724×10^{-6} Ohm-cm. **[4]**

    b)   What will be resistance of same geometry if temperature rises by 20°C? Assume temperature coefficient of resistance to be equal to 0.004 Ohm per °C. **[2]**

    c)   For a standard 35-micron copper clad laminate, calculate the inductance of 20 cm long track on PCB having width of 0.8 mm. **[5]**

    d)   A 1.6 mm thick PCB laminate having dielectric constant of 4.2 is used to implement distributed capacitance concept for power supply bypassing. The VCC track is routed on top surface of PCB having width 2.0 mm while the underlying GND conductor has a width of 2.5 mm. Both tracks have a length of 20 cm. Calculate the value of capacitance for given track geometry. If the type of laminate is changed to one having dielectric constant of 3.2, what will the value of capacitance? Which laminate is better for the intended purpose and why? **[5]**

Q5) With the help of a schematic arrangement explain in details the type of diagnostic instrument and which of its feature(s) of will be used in following situations :

    a)   A Short circuit exists on two thin tracks running adjacent to each other on PCB. One of the tracks is from data bus and other is from Address bus of a Microprocessor based system. **[8]**

b) SDRAM interface on an embedded Microprocessor based circuit is suspected to be malfunctioning due to set-up and/or hold time violation for RAS (Row Address Select) line. [8]

OR

Q6) a) In selecting DSO (Digital Storage Oscilloscope), explain the significance and importance of following specifications : [8]

   i) Memory Depth.

   ii) Bandwidth.

   iii) Sampling rate.

   iv) Type of sampling.

   b) Explain limitations of following Hardware diagnostic instruments for their use in Mixed signal, high-speed designs where signal integrity is of prime importance : [8]

   i) Analog Oscilloscope

   ii) Digital Storage Oscilloscope

   iii) Logic Analyzer.

   Hence establish the need for Mixed Signal Oscilloscope.

SECTION - II

Q7) A four-channel temperature data logger has following components :

   a) Two RTD and two Thermocouple sensors

   b) Signal conditioning circuit.

   c) ADC

   d) A Microcontroller

   e) 4-digit multiplexed LED display

   f) Data Memory.

Explain in details how will you design software for the data logger using Top-down approach. Explain function of each software module and clearly indicate which module(s) will be coded in Assembly language and which ones in C? Justify your choice. [18]

OR

Q8) a) Explain in details the process of developing software for a Microcontroller based system using a combination of Assembly and C language. **[8]**

b) In finding software faults in a real-time Embedded system, explain the features and limitations (if any) of : **[10]**

    i) Debugger.

    ii) Simulator.

    iii) Microcontroller Starter kits.

    iv) Emulators.

Q9) Explain how environmental tests are related to Warrantee of a product? What are different environmental tests performed on an Electronic Product? How the severities of different tests are decided? **[16]**

OR

Q10) Establish the need for performing different EMI/EMC tests on an electronic Product. Discuss various types of EMI and EMC tests carried out on them. Also explain why the nature and type of test carried out varies with intended location and application of the product? **[16]**

Q11) For the Mini-project that you have done, draw the block schematic and produce all necessary formatted documents that will be released to Production Department for manufacturing. **[16]**

OR

Q12) a) Draw-up a formatted documents list for a PCB assembly that your company wants to take up on large scale. **[8]**

b) What do you understand by the term- Bare Board Testing? Justify the need for it in large-scale manufacturing. Draw a sketch of typical BBT arrangement. In what situation you must use Bare Board Testing? Why? **[8]**

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