

P1351

[3764]-242

B.E. (Electronics)

ELECTRONIC PRODUCT DESIGN

(2003 Course)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidate:

- 1) All questions are compulsory.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Neat diagrams must be drawn wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of electronic pocket calculator is allowed.
- 6) Assume suitable data, if necessary.

SECTION - I

Q1) a) With the help of a suitable example, explain steps taken to arrive at technical specification of a product to be manufactured on large scale. Explain how techno-commercial feasibility of a product is judged subsequently. [10]

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

OR

Q2) a) For following established practices of reducing Electromagnetic Interference, explain with the help of neat sketches the exact mechanism by which EMI is reduced - i) Twisted pair of wires, ii) Transzorb, iii) Shielding. [12]

b) A Multivibrator circuit uses 2 transistors, 8 resistors, 2 capacitors and 2 diodes. It is followed by a buffer circuit consisting of one transistor and three resistors. If the failure rates of various components are as given below, find MTTF of the circuit in years. [6]

Component	Failure rate per 10^6 hours
Resistor	0.6
Diode	0.2
Capacitor	0.6
Transistor	0.65

- Q3) a) Two tracks on a 1.6 mm thick PCB laminate have a parallel run of 12 cm on opposite faces of a double sided PCB. The track thickness is 35 micron and the track width is 0.4 mm. If the relative dielectric constant of PCB laminate is 4.2 and conductivity of copper to be 1.72×10^{-6} Ohm-cm, calculate the -3dB frequency of the low pass filter formed by parasitic components with above geometry. Assume that parasitic R and C are lumped. [8]
- b) Calculate the inductance of a PCB track having length of 10 cm and width of 0.4 mm. Track thickness is 35 microns. [8]
- Compare the inductance of track if its width is reduced to half. [8]

OR

- Q4) Discuss the mechanism of generation and preventive methods for following phenomena in High-speed PCB Designs - (i) Crosstalk, (ii) Reflections (iii) Skin Effect, (iv) Ground Bounce. [16]

- Q5) In the context of Digital Storage Oscilloscope (DSO), explain the factors that determine the choice between following alternatives. Justify your choice with reasoning. (i) ALT and CHOP mode, (ii) Normal and AUTO modes, (iii) AC and DC coupling, (iv) Real and Equivalent time sampling, (v) CH1 and CH2 triggering, (vi) Edge and Level triggering, (vii) TV and Line triggering. [16]

OR

- Q6) a) Draw the circuit diagram of Class AB audio power amplifier with driver stage and explain how you will carry out DC analysis on the above circuit. Also explain what important information you can derive from AC analysis for above circuit? [8]
- b) Explain the meaning of term - Signal Integrity. Also explain with the help of neat sketches how it is affected by limited (i) Bandwidth, (ii) Sampling rate, (iii) Memory depth and (iv) Impedance of probe. [8]

SECTION - II

- Q7) With the help of suitable example, explain how various phases of software design are detailed out. The discussion should include phases like - Problem definition, Software structure diagram, Modular programming, Testing and debugging. [18]

OR

- Q8) Discuss the advantages and limitations of following methods and tools of software debugging - (i) Single stepping, (ii) Break points, (iii) Software simulators, (iv) Emulators, (v) Integrated Development Environment (IDE). [18]

Q9) a) For electronic products listed below, explain with justification the type of environmental tests necessary - (i) An Industrial Controller, (ii) Washing Machine, (iii) Mobile Phone, (iv) Bedside ECG Monitor. [8]

b) For above products, explain with justification the type of EMI/EMC tests that will be necessary. [8]

OR

Q10) Explain why electronic products are required to be tested for - (i) Conducted EMI, (ii) Radiated EMI, (iii) Conducted Susceptibility, (iv) Radiated Susceptibility. For each of the above type of test, give a suitable practical example to explain the mechanism that upsets normal working of electronic products. [16]

Q11) With the help of neat diagrams explain the significance of following in context of PCB fabrication and assembly - (i) Drilling details, (ii) Edge clearances, (iii) Component Assembly diagram, (iv) Plating on PCB tracks, (v) Solder Mask, (vi) Laminate grade. [16]

OR

Q12) a) What do you understand by the term - Bare Board testing? In what situations it is recommended to get PCBs bare board tested? Why? [4]

b) Draw circuit diagram of Linear Regulated Power Supply (from AC Mains entry) and draw up the Bill of Materials for the same in tabular form. How will you write Product Test Specifications for the regulator? [12]

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