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SB-3518

M. Sc. (Part - II) Examination

March / April – 2011

Physics : Paper - III

(Microelectronics, Computers & Microprocessor)

(*SPL : ELECTRONICS-II*)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M.Sc. (Part - II)**

Name of the Subject :

☛ **Physics - 3**

☛ Subject Code No. : **3 5 1 8** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answers to the two sections must be written in separate books.
(3) Symbols have their usual meaning.
(4) Figures to the right indicate full marks.
(5) One can use non-scientific calculator for calculations.

SECTION - I

1 (a) Show the circuit diagram of an NMOS enhancement device connected as resistance. Sketch resistance characteristics. Comment on your results. **4**

(b) What is an ECL circuit? List their properties and advantages. **3**

(c) Give the architecture for three input NAND gate using NMOS transistors. Verify its truth table with switch analogy operation. **4**

2 (a) Sketch the circuit of a transmission gate by using CMOS transistor's. Explain the operation of this switch. **7**

(b) Give the small signal model of an NMOS amplifier. Derive the equation for gain of an amplifier. Make your comments on your results. **5**

OR

2 (b) 'A single transistor is not an ideal current source.' Justify this statement and explain different types of current sources with their limitations. **7**

(b) In the circuit of MOSFET inverter with depleation load, both Q_1 and Q_2 have K =25 $\mu A/V^2$ and V_T = 1.5 Volt. The aspect ratio are $\frac{W}{L}$=5 for Q_1 and $\frac{W}{L}$=1 for Q_2. The supply voltage V_{DD}=5 Volt. Determine V_{OL},V_{OH}, V_{IL} and V_{IH} and the noise margins. **5**

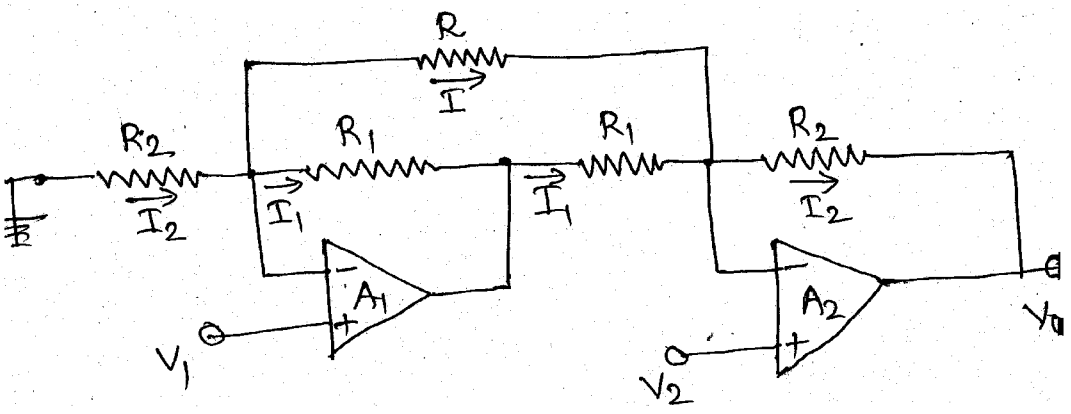
3 (a) Draw the high frequency response equivalent circuit for CE amplifier. Write their operation Transfer Function $A_{VH}(s)$ and derive its solution. **7**

(b) Give the architecture for Bistable latch using Integrated Injection Logic (I^2L) circuits. **5**

OR

3 (a) What is CCD ? Explain operation of three phase CCD in detail. **7**

(b) For the instrumentation amplifier shown below; **5**



verify that $V_o = \left(1+\frac{R_2}{R_1}+\frac{2R_2}{R}\right)(V_2 - V_1)$. Note that the gain may be adjusted by varing R.

SECTION - II

4 (a) Define base of a number system. **2**

(b) Convert following Hexadecimal numbers into Binary and BCD numbers. **2**

(i) $6E_{16}$ (ii) 10_{16}

(c) Calculate number of address and data lines in the following blocks : **2**

(i) 2×16 and (ii) 16×2.

(d) What is the function of ALE pin of 8085 ? **2**

(e) Using any universal gates, design 3-lines to 8 line decoder. **3**

5 (a) Giving suitable examples, write 1S and 2S complement methods of negative representation. **7**

(b) Giving all the steps, explain how a digital computer will perform the $0101_2 \times 011_2$ multiplication task. **5**

OR

5 (a) Draw the circuit diagram of a one dimensional basic memory cell and explain its 'Read' and Write' operations. Design 3×3 memory block using one dimensional basic memory cells. **7**

(b) Assuming starting condition to be 'Low' draw the waveform of the digital pattern 010111_2 if recorded in (i) NRZ (ii) NRZ mark and (iii) NRZ Bi-phase recording Systems. **5**

6 (a) With example explain the role of 'stack' and 'stack pointer' in the microprocessor system during **7**

(i) PUSH and POP operation and

(ii) CALL and RET operation.

(b) What does the following instruction of 8085 processor do ? **5**

(i) RET (ii) ANI D6 (iii) IN F6H (iv) RAL (v) RLC.

OR

6 (a) What is the need of a D/A converter ? With circuit diagram and formula, describe 4 bit R-2R type D/A converter. If the logic 'l' is equal to +5.0 Volt and logic 'O' is equal to 0.0 Volt, calculate the output voltage from a 4 bit R-2R type D/A converter for the following digital inputs : **7**

(i) 0100_2 and

(ii) 0010_2.

(b) Using mnemonics, write a program to generate square wave with 25% duty cycle on the SOD line of the 88085 microprocessor. **5**