PG/IIS/ELC-202/11

M.Sc. 2nd Semester Examination, 2011

ELECTRONICS

(*Digital Electronics*)

PAPER—ELC-202

(Theory)

Full Marks : 40

Time : 2 hours

Answer **Q. No. 1** and any **three** questions from the rest

The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. Answer any *five* questions : 2×5

(*a*) Draw 'NOT' gate using transistor.

(*b*) For K-Map given in the Fig 1. Find the minimal sum of the products.

	$\bar{A}\bar{B}$	$\bar{A}B$	AB	$A\bar{B}$
$\bar{C}\bar{D}$		1	1	
$\bar{C}D$		1		
CD		1	1	
$C\bar{D}$		1	1	

Fig. 1

(*c*) Why the successive approximation type ADC is faster ?

(*d*) Why EPROM is called floating gate type ROM ?

(*e*) What do you mean by the 'Resolution' of a D/A converter ?

(*f*) Implement the following Boolean, expression using all 'NOR' gates :

$$Z = (A + B)\,(B + C)\,(C + A)$$

2. An agreement exists between three persons : A, B and C that calls for all business policy decisions by a majority vote. But in the interest of avoiding animosity among them the voting is to be done secretly through a voting machine.

   (a) Develop an appropriate truth table.

   (b) From the results of (a) design a digital logic circuit that provides an output of logic-1, whenever the majority vote is 'yes'. Be sure to finish a minimum implementation.

   (c) Modify the logic diagram of voting machine of part (b) so that only '**NAND**' gates are used.

   2 + 4 + 4

3. (a) What is charged coupled device memory ? How does it differ from Shift Rgister ? Explain its working principle.

   (b) Design a memory circuit using two memory units of size 1K × 4 to make a memory of size 2K × 4. (1 + 1 + 3) + 5

4. (a) Mention the applications of A/D and D/A converters (two examples in each case).

(*b*) Explain with a suitable diagram, the working principle of a weighted-register D/A converter.

(*c*) Explain, with a diagram, the working principle of a CMOS inverter. 2 + 4 + 4

5. (*a*) What is the difference between Astable and Monostable multivibrators ?

(*b*) Explain the working principle of Astable multivibrator using IC-555. Show all the necessary diagrams.

(*c*) The values of two resistors $R_A = R_B = 1\text{k}\Omega$ and the capacitor, $C = 0{\cdot}01\ \mu\text{F}$ in the 555-Astable multivibrator are assigned. Find the frequency of the output voltage. 2 + 6 + 2

6. Two functions $f_1 = \Sigma m\ (1, 2, 3, 5, 6, 7, 8, 12, 13, 15)$ and $f_2 = \Sigma m\ (2, 3, 4, 8, 13)$ are plotted in two separate K-maps. From these two K-maps find the K-maps for (*i*) $F_1 = f_1 \cdot f_2$ and (*ii*) $F_2 = f_1 + f_2$ and find the POS form of F_1. 2 + 2 + 6
