BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCE AND ENGINEERING

DEPARTMENT OF ENGINEERING AND PHYSICS

DIGITAL ELECTRONICS

EEE1207

Examination Paper

This examination paper consists of 5 pages.

Time Allowed: 3 hours.

Total marks: 100

Special requirements: Non programmable scientific calculator

INSTRUCTIONS

1.Answer 5 questions only.

2. Each question carries 20 marks.

3. Show your steps clearly in any calculation.

4. Start the answers for each question on a fresh page.

MARK ALLOCATION

QUESTION	MARKS
1.	20
2.	20
3.	20
4.	20
5.	20
6.	20
TOTAL	100

QUESTION 1

a) The logic circuit shown in the given fig.2 below can be minimised to what? **[4]**
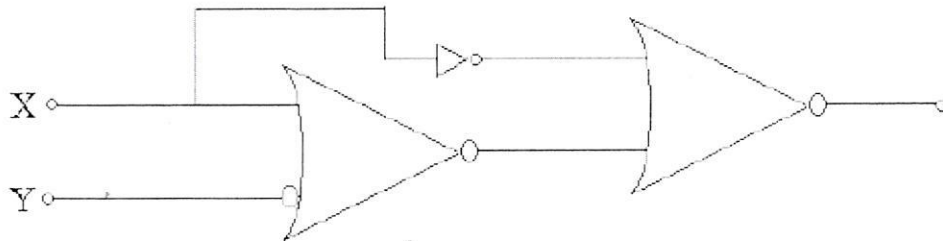
b) Perform 2's complement subtraction of 7 - 10 (noted the numbers are in base 10) **[3]**

c) Simplify the Boolean expression $F = C(B + C)(A + B + C)$. **[4]**

d) Determine the binary numbers represented by the following decimal numbers. **(6)**

   (i)   25.5

   (ii)   10.625

   (iii) 0.6875

e) Convert 2222 in Hexadecimal number. **[3]**

QUESTION 2

a) Simplify the following expression into sum of products using Karnaugh map $F(A,B,C,D) = \Sigma(1,3,4,5,6,7,9,12,13)$. **[7]**

b) Give the details of excess 3 code and gray code using 4-binary digits. Compare the two codes. **[7]**

c) What is a flip-flop? Briefly state the difference between a Latch and a flip-flop, stating the application of a flip-flop. **[5]**

d) What is the decimal equivalent of hex number A5? **[1]**

QUESTION 3

a) Simplify and draw the logic diagram for the given expression

$$F = \overline{ABC} + \overline{AB}C + \overline{A}B\overline{C} + A\overline{BC} + A\overline{B}C$$

[7]

b) Discuss the difference between a demultiplexer and a decoder. [4]

c) Add 648 and 487 in BCD code. [3]

d) Give the truth table of S-R and D-flip-flops. Convert the given S-R flip-flop to a D-flip-flop. [6]

QUESTION 4

a) Prove the following Boolean identities. [4]

(i) $XY + YZ + \overline{Y}Z = XY + Z$

(ii) $A.B + \overline{A}.B + \overline{A}.\overline{B} = \overline{A} + B$

b) Convert the following
   i. 430 to Excess-3 code. [2]
   ii. 10110 to Gray code. [2]

c) What is a decoder? Draw the logic circuit of a 3 line to 8-line decoder and explain its working principle. [8]

d) What are synchronous counters? [2]

e) What are the advantages of a CMOS? [2]

QUESTION 5

a) What is the octal equivalent of the decimal number 84?   [2]

b) Design a MOD-6 synchronous counter using J-K Flip-Flops.   [7]

c) What are the gates required to build a half adder and illustrate using a diagram?
   [6]

d) Convert   3117   (decimal   value)   to   hex,   then   from   hex   to   binary.
   [3]

e) Convert   the   following   (BCD)   1001011110110101   to   its   decimal   equivalent.
   [2]

QUESTION 6

a) Design an 8 to 1 multiplexer by using the four variable function given by F (A, B, C,
   D) = Σm(0,1,3,4,8,9,15).   [10]

b)
   What is a shift register? What are its various types and list some of its applications?
   [6]

c) What   are   the   advantages   of   digital   techniques   over   analogue   techniques?
   [4]

THE END