UNIT 1 (Number Systems): TUTORIAL SHEET

Q1: **Convert the given numbers in a corresponding row in other base systems. Solve them using a step wise procedure, and fil the result in the table?**

Decimal	Binary	Octal	Hexadecimal
151			
		174	
	10110111		
			AB3
		1023	
			15C
	101111		
			C35
261			
	11011001		
		1375	

Q2: **Convert the given fractions in a corresponding row in other base systems. Solve them using a step wise procedure, and fil the result in the table?**

Decimal	Binary	Octal	Hexadecimal
67.24			
		53.25	
	101.1101		
			15C.38
		526.15	
			15C
	1011.0111		
97.125			
	10100.1101		
		67.24	

Q3. **Find 1's and 2's complement of following numbers: Solve them using a step wise procedure, and fil the result in the table?**

Number	1's	2's
00010000		
00000000		
11011010		
10000101		
11111111		

Q4. **Find 9's and 10's complement of following numbers:**
Solve them using a step wise procedure, and fil the result in the table?

Number	9's	10's
25345036		
63478600		
00000000		
35000000		
12578955		

Q5. **Find 7's and 8's complement of following numbers:**
Solve them using a step wise procedure, and fil the result in the table?

Number	7's	8's
137		
471		
214		
1103		
405		

Q6. **Find 15's (F's) and 16's complement of following numbers:**
Solve them using a step wise procedure, and fil the result in the table?

Number	15's (F's)	16's
A19		
ECE		
B8D5		
1F9		
AC7		

Q7. **Perform Binary addition on the given pair of numbers:**

(a) 1100 + 0111
(b) 10010 + 10110
(c) 100110 + 101010
(d) 101001 + 110011
(e) 110001 + 101100

Q8. **Perform subtraction on the given unsigned Binary numbers using 1's and 2's complement:**

(a) 1101 – 0111
(b) 110010 – 100110
(c) 100110 – 100011
(d) 1010 – 110101
(e) 10101 – 101000

Q9. **Perform Octal addition on the given pair of numbers:**

(a) 372 + 463

(b) 512 + 477
(c) 175 + 152
(d) 214 + 504
(e) 110321 + 56573

Q10**. Perform Octal subtraction on the given unsigned Octal numbers using 7's and 8's complement**:

(a) 213 – 127
(b) 1100 – 775
(c) 224 – 614
(d) 235 – 532
(e) 100 – 27

Q11. **Perform hexadecimal addition on the given pair of numbers:**

(a) 1372 + 463A
(b) 1B5F + 27E9
(c) B90D + DC4E
(d) ECE + CE
(e) DEAD + F35B

Q12**. Perform Hexadecimal subtraction on the given unsigned Hexadecimal numbers using 15's and 16's complement**:

(a) 4B5 – 1F7
(b) ACE – 1FF
(c) 19B – 28D
(d) A69B – C67F
(e) ECE – ADF

Q13. **Perform binary multiplication**

(a) 1101 * 1001
(b) 1011 * 1101
(c) 1111 * 1111
(d) 1000.11 * 1010.01
(e) 10011.10 * 10001.11

Q14. **Perform binary division**

(a) 11011001 / 1011
(b) 165 / 17
(c) 1011001.101 / 101
(d) 100101.001 /100
(e) 101000.011 / 1011

Q15. **Write 8-bit signed magnitude, 1's complement and 2's complement representations for following decimal numbers:**

9, 15, 0, 49 and 115

Q16. **Perform following operations using Signed Complement Method?**

(a) +14 + 9
(b) +14 - 9
(c) -14 + 9
(d) -14 - 9

Q17. **Perform following operations using Signed Complement Method?**

(a) +27 + 57
(b) +27 - 57
(c) -27 + 57
(d) -27 - 57

Q18. **Based on the inferences drawn from the above results (of Q2 and Q3), explain the concept of overflow? What are the ways to eliminate this problem?**

Q19. **Perform BCD arithmetic:**

a. 184 + 576
b. 475 – 340
c. 357 – 432
d. 112 + 255
e. 517 – 299

Q20. **Perform Excess-3 arithmetic:**

a. 27 + 39
b. 211 + 478
c. 163 – 467
d. 639 – 255
e. 517 + 299

Q21. **Convert Binary to Gray:**

a. 1001
b. 0111
c. 1000
d. 110011
e. 100110

Q22. **Convert Gray to Binary:**

a. 1110
b. 0111
c. 1010
d. 110011
e. 100110

Q23. B**ased on ASCII code, answer the following:**

- Decode the following ASCII code:
  1010011 1110100 1100101 1110110 1100101 0100000 1001010 1101111 1100010 1110011.
- Write the expression "G. Boole" in ASCII, using an eight-bit code. Include the period and the space. Treat the leftmost bit of each character as a parity bit. Each eight-bit code should have odd parity. (George Boole was a 19th-century mathematician. Boolean algebra, introduced in the next chapter, bears his name.)
- What bit must be complemented to change an ASCII letter from capital to lowercase and vice versa?

Q24. **Complete the following table:**

Weighted codes	**Non- weighted codes**	**Self-Complementing codes**	**Non Self complementing codes**

Q25. **Find the value of a parity bit for following data:**

Data	Even Parity	Odd Parity
11001100011		
10010101111		
10000011000		
10101100001		

Q26. **Using Hamming code, how will we transmit an information code 10110 for odd parity.**

Q27. **Using Hamming code, how will we transmit an information code 11000100? (Assumptions: Even Parity and Parity bits from Left to Right).**

Q28. **Assume data 0010001 has been received.**

a. **Determine whether the code is correct? (Assumptions: Even Parity and Parity bits from Left to Right)**
b. **Repeat the process again. (Parity bits from Right to left).**

Q29. **Represent 1011101010011 in (IEEE standard 754) single precision floating point form**.

Q30. **Covert a decimal number 5.347 x 10^5 to a single precision floating-point Binary.**

Unit 1 (Number System): GATE PROBLEMS

Q1. The subtraction of a binary number Y from another binary number X, done by adding 2's compliment of Y to X, results in a binary number without overflow. This implies that the result is

a. Negative and is in normal form

b. Negative an is in 2's compliment form

c. Positive and is in normal form

d. Positive and is in 2's compliment form

Q2. 2's complement representation of a 16 bit number (one sign bit and 15 magnitude bits) is FFFF. Its magnitude in decimal representation is

a.0

b.1

c.32,767

d.65,535

Q3. An equivalent 2's complement representation of the 2's complement number is 1101 is

a.110100

b.001101

c.110111

d.111101

Q4. Two 2's complement numbers having sign bits x and y are added and the sign bit of the result is z. Then, the occurrence of overflow is indicated by the Boolean function

(a) $x\ y\ z$ (b) $\bar{x}\ \bar{y}\ \bar{z}$

(c) $\bar{x}\ \bar{y}\ z + x\ y\ \bar{z}$ (d) $xy + yz + zx$

Q5. The 2's complement representation of – 17 is

a.01110

b.101111

c.11110

d.10001

Q6. 4 bit 2's complement representation of a decimal number is 1000. The number is

a. +8

b.0

c. -7

d. -8

Q7. The range of signed decimal numbers that can be represented by 6 bit 1's complement form is

a. -31 to +31

b. -63 to +64

c. -64 to +63

d. -32 to +31

Q8. 11001, 1001 and 111001 correspond to the 2's complement representation of which one of the following sets of number?

a.25, 9 and 57 respectively

b. -6, -6 and -6 respectively

c. -7, -7 and -7 respectively

d. -25, -9 and -57 respectively

Q9. Decimal 43 in Hexadecimal and BCD number system is respectively

a.B2, 0100 0011

b.2B, 0100 0011

c.2B, 0011 0100

d.B2, 0100 0100

Q10. A new Binary Coded Pentary (BCP) number system is proposed in which every digit of a base-5 number is represented by its corresponding 3-bit binary code. For example, the base-5 number 24 will be represented by its BCP code 010100. In this number system, the BCP code 100010011001 corresponds to the following number in base-5 system

a.423

b.1324

c.2201

d.4231

Q11. X = 01110 and Y = 11001 are two 5 bit binary numbers represented in 2's complement format. The sum of X and Y represented in 2's compliment format using 6 bits is

a.100111

b.001000

c.000111

d.101001

Q12. The two numbers represented in signed 2's complement form are P = 11101101 and Q = 11100110. If Q is subtracted from P, the value obtained in signed 2's complement form is

a.100000111

b.00000111

c.11111001

d.111111001

Q13. The number of bytes required to represent the decimal number 1856357 in packed BCD (Binary Coded Decimal) form is …….

Q14. If 73_x (in base-x number system) is equal to 54_y (in base-y number system), the possible values of x and y are -

(A) 8, 16
(B) 10, 12
(C) 9, 13
(D) 8, 11

Q15. Let A = 1111 1010 arid B = 0000 1010 be two 8-bit 2's complement numbers. Their product in 2's complement is -

(A) 1100 0100
(B) 1001 1100
(C) 1010 0101
(D) 1101 0101

Q16. $(1217)_8$ is equivalent to -

(A) $(1217)_{16}$
(B) $(028F)_{16}$
(C) $(2297)_{10}$
(D) $(0B17)_{16}$

Q17. P is a 16-bit signed integer. The 2's complement representation of P is $(F87B)_{16}$. The 2's complement representation of 8*P is -

(A) $(C3D8)_{16}$
(B) $(187B)_{16}$
(C) $(F878)_{16}$
(D) $(987B)_{16}$

Q18. The 16-bit 2's complement representation of an integer is 1111 1111 1111 0101; its decimal representation is -

(A) 10
(B) 11
(C) -10
(D) -11

Q19. P is a 16-bit signed integer. The 2's complement representation of P is $(F87B)_{16}$. The 2's complement representation of 8*P

(A) $(C3D8)_{16}$

(B) $(187B)_{16}$

(C) $(F878)_{16}$

(D) $(987B)_{16}$

Q20. Consider the equation $(123)5 = (x8)_y$ with x and y as unknown. The number of possible solutions is _____ .
(A) 1
(B) 2
(C) 3
(D) 4

Q21. The value of a float type variable is represented using the single-precision 32-bit floating point format IEEE-754 standard that uses 1 bit for sign, 8 bits for biased exponent and 23 bits for mantissa. A float type variable X is assigned the decimal value of −14.25. The representation of X in hexadecimal notation is
(A) C1640000H
(B) 416C0000H
(C) 41640000H
(D) C16C0000H

Q22. The range of integers that can be represented by an n bit 2's complement number system is

(A) -2^{n-1} to $(2^{n-1}-1)$
(B) $-(2^{n-1}-1)$ to $(2^{n-1}-1)$
(C) -2^{n-1} to 2^{n-1}
(D) $-(2^{n-1}+1)$ to $(2^{n-1}+1)$

Q23. Consider the equation $(43)_x = (y3)_8$ where x and y are unknown. The number of possible solutions is _____.
(A) 3
(B) 4
(C) 5
(D) 6

Q24. The number $(123456)_8$ is equivalent to

(A) $(A72E)_{16}$ and $(22130232)_4$
(B) $(A72E)_{16}$ and $(22131122)_4$
(C) $(A73E)_{16}$ and $(22130232)_4$
(D) $(A62E)_{16}$ and $(22120232)_4$

Q25. $(34.4)_8 \times (23.4)_8$ evaluates to

A)	$(1053.6)_8$
B)	$(1053.2)_8$
C)	$(1024.2)_8$
D)	None of these