SE | IT | III (REV) 29/5/2012

Digital logic Design & Application

Con. 4469 GN-8348

(3 Hours) [Total Marks 100

N.B.N. B. : (1) Question NO.1 is compulsory. .
(2) Solve any four out of remaining six questions.

1. a. Convert $(243)_5$ into equivalent base 8 number and base 7 number. (4)

b. Perform the following operations – (6)

1) $(F8F)_{16} + (D49)_{16}$
2) $(762)_{BCD} + (238)_{BCD}$
3) $(246)_{10} - (435)_{10}$ using 2's complement method.

c. Convert SR flip flop to JK flipflop. (5)

d. With the help of suitable example, explain how hamming code is able to locate and correct single bit error. (5)

2. a. Implement one digit BCD adder using IC 7483. Explain its working. Expand your design to implement 4 digit BCD adder. (10)

b. Implement 2 bit comparator using active low decoder. (10)

3. a. Implement 4 bit Asynchronous up counter. Also sketch the timing diagrams. (10)

b. Explain bidirectional shift register with the help of neat diagram. (10)

4. a. Design Mod 12 synchronous up counter using JK Flipflops and NAND gates only. Design the counter as lock out free counter. (12)

b. Script VHDL Code for 3 :8 decoder (8)

5. a. Draw the circuit diagram of TTL NAND Gate and explain its working. (10)

b. Implement full adder using two 4:1 Multiplexers and additional gates (10)

6. a Using Quine McClusky method of minimization minimize (10)
$F = \Sigma m (8,9,10,11,13,15,16,18,21,24,25,26,27,30,31)$.

.b Implement BCD to Excess 3 code converter using NOR Gates only. (10)

7. Write short notes on any two. (20)
a. CAD Tools
b. Race around condition and its remedy in master slave JK Flip flop.
c. Programmable logic devices
d. Priority encoders.

§ E/IT/ sem-III CBSGS 24/5/2012
Data structure & Algorithms

Con. 3893-12.

**GN–5382**

(3 Hours) **[Total Marks : 100**

**N.B.** (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.

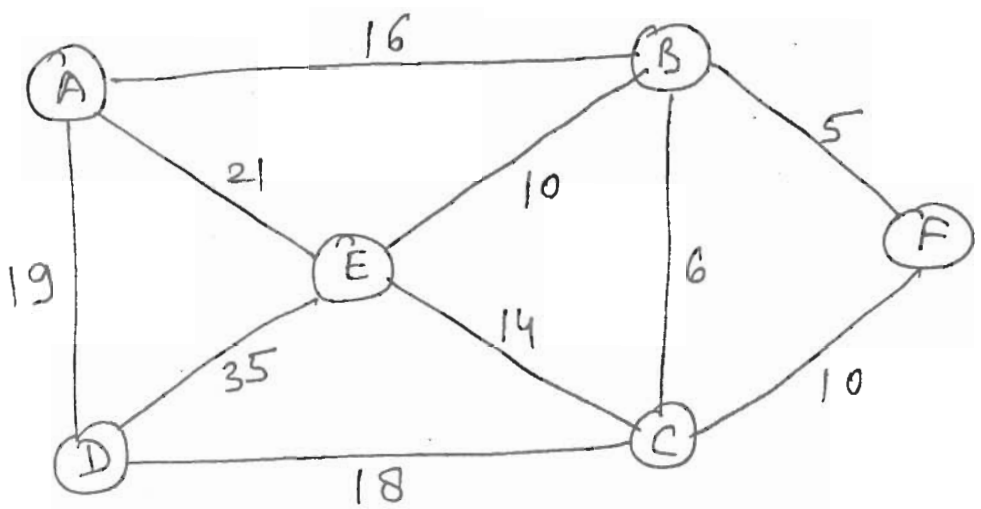
1. (a) What are linear and non-linear data structures ? **5**
   (b) What are Asymptotic notations ? **5**
   (c) Why is it necessary to analyze an algorithm ? **5**
   (d) What are Expression trees ? **5**

2. (a) Develop an algorithm to delete a node from the given binary search tree. Consider all cases. **10**
   (b) Explain the method of Huffman Encoding. Apply Huffman Encoding method for the sentence 'STRUCTURE'. Give Huffman code of each symbol. **10**

3. (a) What is a Priority Queue ? Explain the Insertion and Deletion operations on Priority Queue if it is implemented using Array. **10**
   (b) Write any pattern matching algorithm and explain it with suitable example. **10**

4. (a) Explain selection sort and write a program to implement selection sort. Compare it with Binary Sort. **10**
   (b) Write an algorithm and explain with an example RADIX SORT method. **10**

5. (a) Using Prim's and Kruskal's algorithm find minimum spanning tree for the following graph : **10**




   (b) Give an INFIX expression, write a program to convert it to its 'PREFIX' from. **10**

6. (a) Write a program to implement 'QUICK SORT' and comment on its complexity. **10**
   (b) Write a program to implement 'towers of Hanoi' using recursions. **10**

7. Write down short notes on any **four** :— 20

(a) Expression and realization of ADT's in Java

(b) Comparison of sorting algorithms

(c) Infix, Prefix and Postfix expressions

(d) Space and time complexity

(e) Recursion.

SE | IT - III - 15 May 2012
Applied Mathematics - III

V-L-1st-Hf-Ex-12-BB-99

Con. 3568-12. **GN-5393**

(3 Hours) **[Total Marks : 100**

**N.B. :** (1) Question No. **1** is **compulsory.**
(2) Solve any **four** out of remaining **six** questions.
(3) Answers to **subquestions** should be answered **together.**

1. (a) If $A = \begin{bmatrix} 3 & 2 & 2 \\ 1 & 3 & 1 \\ 5 & 3 & 4 \end{bmatrix}$, find adj A, $A^{-1}$. Also find B such that $AB = \begin{bmatrix} 3 & 4 & 2 \\ 1 & 6 & 1 \\ 5 & 6 & 4 \end{bmatrix}$. **5**

(b) Find $L\left\{\frac{\cosh 2t \sin 3t}{t}\right\}$. **5**

(c) A regular function of constant magnitude is cosntant. **5**

(d) Find the Fourier series for $f(x) = 1 - x^2$ in $(-1, 1)$. **5**

2. (a) Expand $f(x) = \begin{cases} \pi x & 0 < x < 1 \\ 0 & 1 < x < 2 \end{cases}$ with period 2, into a Fourier series. **6**

(b) Find the orthogonal trajectories of the family of curves $e^{-x}(x \sin y - y \cos y) = c$. **7**

(c) Using convolution theorem, prove that, $L^{-1}\left\{\frac{1}{s}\tan^{-1}a/s\right\} = \int_0^t \frac{1}{u}\sin au\, du$. **7**

3. (a) Show that every square matrix A can be uniquely expressed as P + iQ. Where P and Q are Hermitian matrices. **6**

(b) Using Cauchy's residue theorem, evaluate, $\oint_C \frac{12z-7}{(z-1)^2(2z+3)}dz$ where **7**

C is the circle (i) $|z| = \frac{1}{2}$ (ii) $|z + i| = 3$.

(c) Solve the following equation by using Laplace transform, $\frac{dy}{dt} + 2y + \int_0^t y\,dt = \sin t$ **7**

given that $y(0) = 1$.

4. (a) State Laplace's equation in polar form and verify it for $u = r^2 \cos 2\theta$ and also find V and f(z). **6**

(b) Find Fourier series for $f(x) = \sqrt{1-\cos x}$ $0 < x < 2\pi$ and hence show that **7**

$$\sum_{n=1}^{\infty} \frac{1}{4n^2-1} = \frac{1}{2}.$$

(c) Evaluate $\int_0^{\infty} t\sqrt{1+\sin t}\, dt$. **7**

5. (a) Using Residue theorem, Evaluate $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$. 6

(b) Reduce the following matrix to normal form and find its rank. 7

$$\begin{bmatrix} 3 & 2 & 5 & 7 & 12 \\ 1 & 1 & 2 & 3 & 5 \\ 3 & 3 & 6 & 9 & 15 \end{bmatrix}$$

(c) (i) Express the function as Heaviside's unit step function and find their Laplace transforms. 4

$f(t) = 0 \quad 0 < t < 1$

$= t^2 \quad 1 < t < 3$

$= 0 \quad t > 3.$

(ii) Find L { f(t) } where $f(t) = t \quad 0 < t < 1$ 3

$= 0 \quad 1 < t < 2$

and f(t) is a periodic function with period 2.

6. (a) Investigate for what values of $\lambda$ and $\mu$ the equations— 6

$x + 2y + 3z = 4$

$x + 3y + 4z = 5$

$x + 3y + \lambda z = \mu$

have (i) no solution (ii) a unique solution (iii) an infinite number of solution.

(b) Show that the set of functions $\sin(2n + 1)x$, $n = 0, 1, 2, - - - - -$ is orthogonal over $[0, \pi/2]$. Hence construct orthogonal set of functions. 7

(c) Find all Laurent's expansions of the function $f(z) = \frac{2 - z^2}{z(1-z)(2-z)}$. 7

7. (a) Find L { cost cos 2t cos 3t }. 6

(b) Show that the vectors [1, 0, 2, 1], [3, 1, 2, 1], [4, 6, 2, – 4], [ – 6, 0, – 3, – 4] are linearly dependent and find the relation between them. 7

(c) Obtain half range sine series for f(x) where $f(x) = \begin{cases} x & 0 < x < \pi/2 \\ \pi - x & \pi/2 < x < \pi \end{cases}$ 7

Hence find the sum of $\sum_{2n-1}^{\infty} \frac{1}{n^4}$.

Hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + - - - -$

———S———

SE | IT | III (Rev) 19|5|2012
Electronics Devices & Circuits.

mk.H.1stHlf12.62

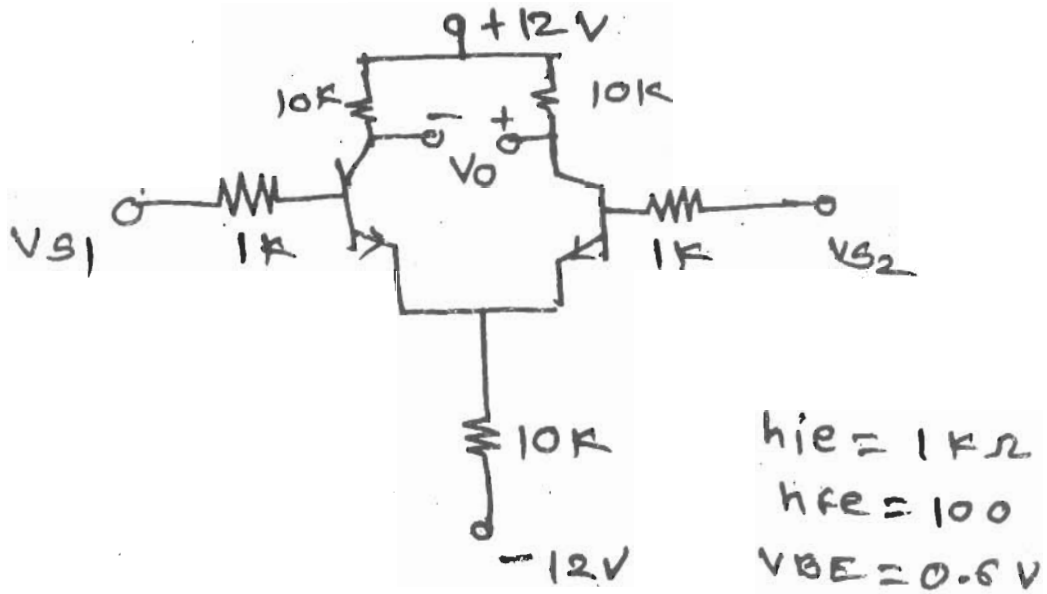
**Con. 4055-12.** **GN-5387**

(3 Hours) **[ Total Marks : 100**

**N.B.** (1) Question No. **1** is **compulsory**.
(2) Solve any **four** questions from remaining **six** questions.
(3) **Figures to the right** indicate **full** marks.
(4) Assume suitable **data if necessary**.

1. (a) Explain the working of a Non-inverting adder using Op-amp. **5**
(b) Explain three terminal voltage regulator. **5**
(c) State and explain Barkhausen criterion for oscillator. **5**
(d) Explain Practical integrator. **5**

2. (a) For differential amplifier find $I_{CQ}$, $V_{CEQ}$, Ad, Ac and CMRR. **10**




(b) Explain internal block diagram of monostable multivibrator using IC 555 and explain one application of it. **10**

3. (a) Explain instrumentation amplifier using 3 Op-amp. Find the expression for output voltage. **10**
(b) Design astable multivibrator using IC 555 for $F_O$ = 1 kHz, duty cycle = 25%. **10**

4. (a) Design a first order lowpass filter for cut-off frequency of 1 kHz and pass band of 10. **10**
(b) Draw and explain the working of a triangular and square wave generator using Op-amp. **10**

5. (a) What are advantages of active filters ? With the help of circuit diagram, explain the operation of second order low pass filter. **10**
(b) Design Wein bridge oscillator for frequency of 1 kHz. **10**

6. (a) Design a voltage regulator using IC 723 for the following specifications :— 10
$V_0 = 5$ V, $I_0 = 100$ mA, $I_{sc} = 150$ mA, $V_{sense} = 0{\cdot}7$ V.

(b) A 6 bit DAC has an input 100101 and 10 V reference voltage. Find — 10

(i) Output Voltage

(ii) Conversion Resolution.

7. Explain the following :—

(a) Switching mode regulator 5

(b) Schmitt trigger in Non-inverting mode 5

(c) Successive approximation type ADC 5

(d) RC phase shift oscillator. 5