08/05/13 Sem III

IT. Maths (III)

Applied Maths: IV

Con. 6414-13. **GS-6132**

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

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

1. (a) If $L\{f(t)\} = \overline{F}(s)$, then prove that $L\left\{\int_0^t f(u)\,du\right\} = \frac{\overline{F}(s)}{s}$ hence find : **5**

$$L\left\{\int_0^t \sin u \cos 2u\, du\right\}.$$

(b) Expand Fourier series for $f(x) = |x|$ in $(-1, 1)$. **5**

(c) Evaluate $\int |z| dz$ along the left half of the unit circle $|z| = 1$ from $z = -i$ to i. **5**

(d) Show that every square matrix can be uniquely expressed as the sum of a Harmitian matrix and Skew-Harmitian matrix. **5**

2. (a) Find half range sine series for $f(x) = x(\pi - x)$ in $(0, \pi)$ hence deduce that : **6**

$$\sum \frac{(-1)^n}{(2n-1)^3} = \frac{\pi^3}{32}.$$

(b) Find the rank of the matrix by reducing it to normal form : **6**

$$\begin{bmatrix} 1 & 2 & 3 & 4 \\ -2 & 3 & 1 & 2 \\ 1 & 0 & 3 & 1 \\ 4 & 2 & 0 & 1 \end{bmatrix}.$$

(c) Find Laplace transform of the following :— **8**

(i) $\frac{e^{-2t} \cos 2t \sin 3t}{t}$

(ii) $t\int_0^u e^{-2u} \cos^2 u\, du$

3. (a) Show that the set of functions cos nx, n = 1, 2, 3... is orthogonal on $(0, 2\pi)$. **6**

   (b) Use adjoint method to find the inverse of **6**

$$\begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}, \text{ if exist.}$$

   (c) Find inverse Laplace transform of :— **8**

   (i) $\log\left(\frac{s^2+a^2}{s^2+b^2}\right)$

   (ii) $e^{-4s}\frac{s}{(s+4)^3}$.

4. (a) If $V = 3x^2y + 6xy - y^3$, show that V is harmonic and find its corresponding analytic function. **6**

   (b) Find a, b, c, if $A = \frac{1}{9}\begin{bmatrix} -8 & 4 & a \\ 1 & 4 & b \\ 4 & 7 & c \end{bmatrix}$ is orthogonal. **6**

   (c) Find Fourier series for $f(x) = \sqrt{1-\cos x}$ in $(0, 2\pi)$ hence deduce that : **8**

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

5. (a) Solve the system of equations, if consistent, **6**

$$x - 2y + 3t = 2$$
$$2x + y + z + t = 4$$
$$4x - 3y + z + 7t = 8.$$

   (b) Find inverse Laplace transform of $\frac{s^2}{(s^2+a^2)(s^2+b^2)}$ by using Convolution theorem. **6**

   (c) Obtain Laurentz and Taylor's series expansion of $f(z) = \frac{(z+1)}{(z+2)(z+3)}$ indicating region of convergence. **8**

6. (a) Evaluate $\oint_c \frac{(z+1)}{(z^2-1)(z-3)} \cdot dz$ where : **6**

(i) $|z-1| = 1$
(ii) $|z+1| = 1$,
(iii) $|z-3| = 1$.

(b) Solve $(\theta^2 - 2\theta + 3)y = \cos 2t$ with $y(0) = 1$, $y'(0) = 0$ by using Laplace transform. **6**

(c) Expand Fourier series for $f(x) = \begin{cases} x & 0<x<1 \\ 1-x & 1<x<2 \end{cases}$ **8**

7. (a) For the following matrix A, find non-singular matrices P and Q such that PAQ is a normal form and hence find Rank of A, **6**

$$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 4 & 2 & 3 & 2 \\ 3 & 0 & 7 & 3 \end{bmatrix}.$$

(b) Find Laplace transform of $f(t) = \begin{cases} \sin t & 0<t<\pi \\ \cos t & \pi<t<2\pi \end{cases}$. **6**

(c) Find real part of of Analytic function whose imaginary part is : **8**

$$V = x^2 + \frac{x}{x^2+y^2} - y^2.$$

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~~EDC — I~~

EDLC

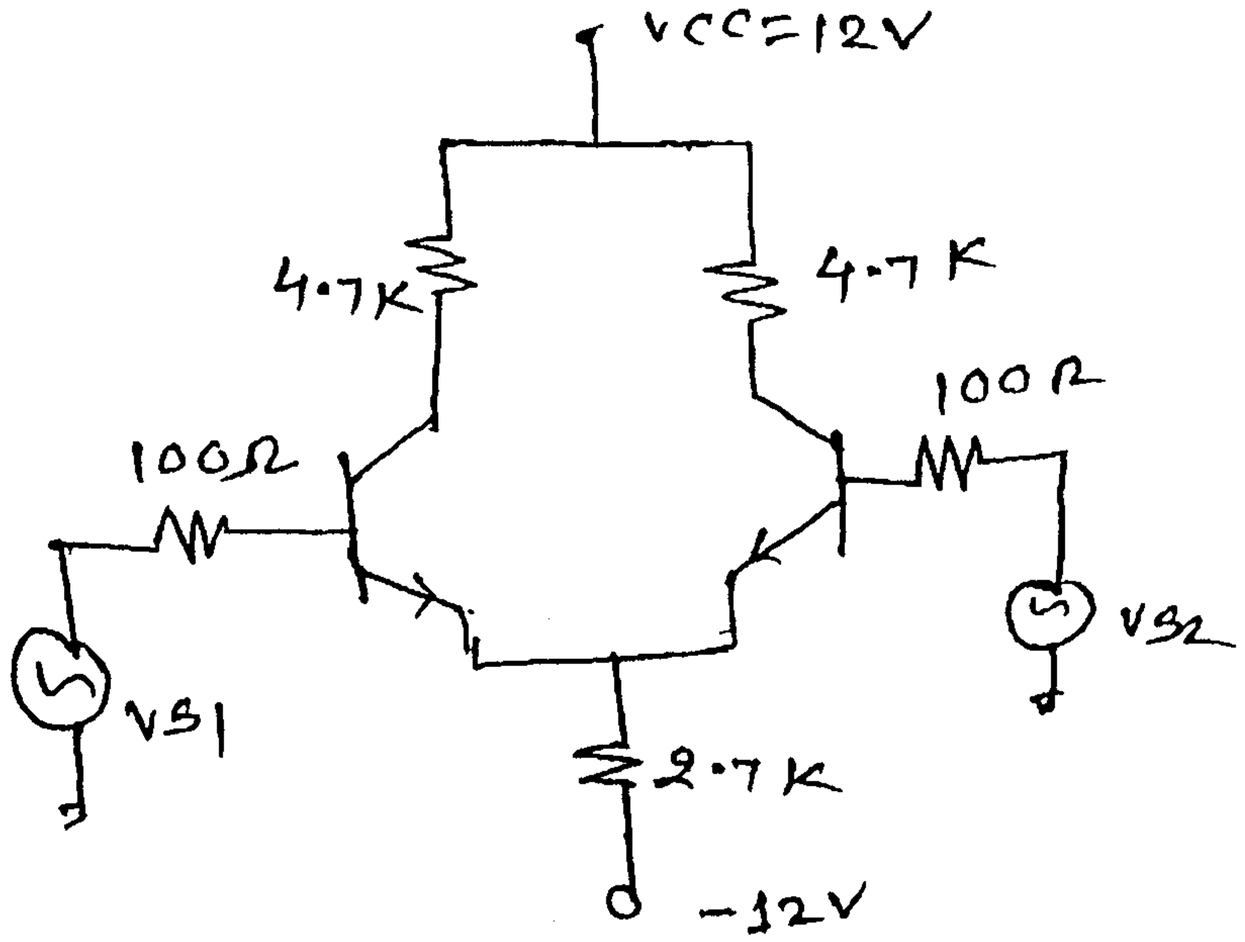
Con. 6463-13. **GS–6243**

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Draw **neat** labelled diagrams wherever **necessary**.
(4) Assume **suitable** data if **necessary**.

1. (a) Explain block diagram of op-amp **5**
   (b) Explain zero crossing detector **5**
   (c) Explain significance of CMRR for a differential amplifier **5**
   (d) Explain the basic principle of D to A converter. **5**

2. (a) Explain internal block diagram of astable multivibrator using IC 555 and explain the one application of it. **10**
   (b) For the differential amplifier find Ad, Ac, CMRR, Rin and Ro. **10**



β = dc = βac = 100
h_{ie} = 1k Ω

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~~GS-6243~~

3. (a) Draw the transfer characteristics of an n-channel JFET with the help of Schockley's expression and explain its significance. **10**
   (b) Design a wide bandpass filter for FL = 1KHz and passband gain equal to 4. Also find quality factor. **10**

4. (a) Draw the block diagram of an oscillator and explain the Barkhausen conditions to obtain sustained oscillations. **10**
   (b) Design a stable multivibrator using 555 for duty cycle 75% and output frequency 5 KHz. **10**

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5. (a) Explain the basic requirement for the instrumentation amplifier. Find the expression for output voltage using three op-amp. **10**

   (b) Explain the non-inverting Schmitt trigger and give the Schmitt trigger advantages over the conventional comparators. **10**

6. (a) Design a voltage regulator using I_c 723, $V_o = 5V$, $I_o = 50$ mA, Isc = 75 mA, vin = 15V. **10**

   (b) Design a R-C phase shift oscillator for output frequency 1 KHz. **10**

7. (a) Explain the averaging amplifier. **5**

   (b) Explain three terminal voltage regulator **5**

   (c) Explain dual slope ADC and state its advantages **5**

   (d) Explain 555 as a voltage controlled oscillator. **5**

SE (SEM-III) I.T. (REV.) May 2013

Data Structure & Algorithms 2015|13

VT-F.H.Exam. May-13-49

Con. 6518–13. **GS–6354**

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

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

1. (a) Explain linear and non-linear data structure with example. **5**
(b) What is recursion ? State its advantages and disadvantages. **5**
(c) What is AVL tree ? Explain with example. **5**
(d) Explain Abstract data type. **5**

2. (a) Write any Pattern Matching Algorithm and explain it with suitable example. **10**
(b) Write a program to implement queue using Array. **10**

3. (a) Write a program to search an element in an array using binary search technique. **10**
(b) Write algorithm for heap sort and explain Descending heap with suitable example. **10**

4. (a) Hash the following in a table of size 12. Use any two collision resolution technique. **10**
98, 20, 94, 27, 67, 99, 41, 0, 4, 17, 2, 15.
(b) Write a program to implement a STACK ADT using Linked List. **10**

5. (a) Write and explain QUICK SORT algorithm with suitable example. **10**
(b) Write an algorithm to traverse a graph using :– **10**
(i) Breadth first search
(ii) Depth first search.

6. (a) Define Binary Tree. Write an algorithm to implement INSERTION and DELETION operation. **10**
(b) What is Doubly Linked List ? Write an algorithm to implement following operations :– **10**
(i) Insertion (All Cases)
(ii) Traversal (Forward and Backward).

7. Write short note(s) on (any **four**) :– **20**
(a) Shortest Path Algorithm
(b) Priority and Circular Queue
(c) Red and Black Tree
(d) Pattern Matching
(e) Expression Tree.

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SE | IT | III | CR) 24|5|13

Digital Logic Design & Application

Con. 6580–13. **GS–6459**

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

N.B. (1) Question No. **1** is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) **All** questions carry **equal** marks.
(4) Assume **suitable** data if **required**.

1. (a) Write the Hamming code for 1100. **5**
   (b) Perform $942_{(10)} - 573_{(10)}$ in BCD using 10's complement. **5**
   (c) Convert T flipflop into D flipflop. **5**
   (d) Implement following function using 8 : 1 MUX **5**
   $F(A, B, C, D) = \sum m(0, 2, 6, 10, 12, 14)$

2. (a) Design and implement BCD to ex-3 code converter. **10**
   (b) Design 2 bit up/down asynchronous counter. **10**

3. (a) Write short note on PAL and PLA. **8**
   (b) Given the logic expression **12**
   $$AB + A\overline{C} + C + AD + A\overline{B}C + ABC$$
   (i) Express in std SOP form
   (ii) Minimize using k-map and realize using only NOR gates.

4. (a) Design 3 bit comparator. **10**
   (b) Minimize using Quine Mc Clusky method **10**
   $F(A, B, C, D) = \sum(0, 1, 3, 5, 7, 9, 11, 14) + d(2, 14)$

5. (a) Design full subtractor using 2 half subtractor. **10**
   (b) Design 2 bit look ahead carry generator. **10**

6. (a) Design a synchronous counter for the following sequence using T F/F **12**
   6–3–5–2–0–4–1–7
   (b) Prove that NAND and NOR are Universal Gates. **8**

7. Write short notes on any **two** :— **20**
   (a) Priority encoder
   (b) VHDL Programming feature
   (c) CAD Tools.

SE | IT | III (R) 30|5|13
GUI, DBM.

Con. 6614–13. **GS–6543**

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

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

1. (a) What is the role of a DBMS, and what are its advantages ? **10**
   (b) Explain in detail in built control and Active-x control in VB. **10**

2. (a) Explain the following terms with example :— **10**
   (i) an entity
   (ii) a weak relationship
   (iii) a strong relationship
   (iv) a recursive relationship.
   (b) Use the small database shown in **figure (1)** and answer the questions :— **10**
   (i) Identify the primary keys
   (ii) Identify the foreign keys
   (iii) Create the Entity Relationship Model (ERM)
   (iv) Create the relational database.

Table name : Student

Stud_no	Stud_name	Stud_DOB
10	Bhuvi	15–8–90
11	Dhriti	26–1–92
12	Shree	5–9–95

Table name : Subject

Sub_code	sub_name	stud_no
301 IT Th	DBMS	12
302 IT Th	OOPS	11
303 IT Th	AT	12
304 IT Th	M-III	10
305 IT Pr	DBMS	11
306 IT Pr	OOPS	12
307 IT Pr	AT	11

figure 1 small database

3. (a) Describe two-phase locking protocols and graph based protocols. **10**
   (b) Explain the use of logs and check points for recovery in a database. **10**

4. (a) Explain the terms ODBC and OLEDB. **10**
   (b) What are the features of GUI ? Explain decision making statements and loop structures statements in VB. **10**

5. (a) What do you mean by deadlocks in database system ? Explain the techniques for deadlock prevention and deadlock detection. **10**
   (b) Why trasaction processing systems usually allow concurrent executions ? Give reasons. **10**

6. (a) What do you mean by a virtual table or a view. What are its characteristics ? **10**
   (b) Write a note on relational algebra. **10**

7. Write short notes on (any **four**) :— **20**
   (a) ACID properties
   (b) OODBMS and ORDBMS
   (c) DBA
   (d) Murphy's law of GUI design
   (e) EER model.
