SE/CMPN & INFT/Sem-III (CBSGS)/ Applied Maths-III / Nov-16

Q.P. Code : 540701

(3 Hours) **[Total Marks : 80]**

NB: 1) Question No. 1 is compulsory.
2) Attempt any three of the remaining.
3) Figures to the right indicate full marks.

1. a) Find the Laplace transform of $te^{3t}\sin 4t$. **05**

b) Find half-range cosine series for $f(x)=e^x$, $0<x<1$. **05**

c) Is $f(z) = \frac{z}{\bar{z}}$ analytic? **05**

d) Prove that $\nabla x(\bar{a}x\nabla \log r) = 2\frac{(\bar{a}.\bar{r})\bar{r}}{r^4}$, where $\bar{a}$ is a constant vector. **05**

2. a) Find the Z-transform of $\frac{1}{(z-5)^3}$ if $|z|<5$. **06**

b) If $V=3x^2y + 6xy-y^3$, show that V is harmonic & find the corresponding analytic function. **06**

c) Obtain Fourier series for the function **08**

$$f(x) = \begin{cases} 1+\frac{2x}{\pi}, & -\pi \le x \le 0 \\ 1-\frac{2x}{\pi}, & 0 \le x \le \pi \end{cases}$$

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

3. a) Find $L^{-1}\left[\frac{(s+2)^2}{(s^2+4s+8)^2}\right]$ using convolution theorem. **06**

b) Show that the set of functions **06**

$1, \sin\left(\frac{\pi x}{L}\right), \cos\left(\frac{\pi x}{L}\right), \sin\left(\frac{2\pi x}{L}\right), \cos\left(\frac{2\pi x}{L}\right), \ldots\ldots\ldots$

Form an orthogonal set in $(-L, L)$ and construct an orthonormal set.

c) Verify Green's theorem for $\int_C (e^{2x} - xy^2)\,dx + (ye^x + y^2)dy$ **08**

Where C is the closed curve bounded by $y^2 = x$ & $x^2 = y$.

4. a) Find Laplace transform of $f(x) = K\frac{t}{T}$ for $0<t<T$ & $f(t) = f(t+T)$. **06**

b) Show that the vector, $\bar{F} = (x^2 - yz)i + (y^2 - zx)\,j + (z^2 - xy)\,k$ is irrotational and hence, find ϕ such that $\bar{F} = \nabla\phi$. **06**

c) Find Fourier series for $f(x)$ in $(0, 2\pi)$, **08**

$$f(x) = \begin{cases} x, & 0 \le x \le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}$$

hence deduce that

$\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \ldots\ldots\ldots$

5. a) Use Gauss's Divergence theorem to evaluate **06**

$\iint_S \bar{N}.\bar{F}\,ds$ where $\bar{F} = 2xi + xyj + zk$ over the region bounded by the cylinder $x^2 + y^2 = 4$, $z = 0$, $z = 6$.

b) Find inverse Z – transform of $f(x) = \frac{z}{(z-1)(z-2)}$, $|z| > 2$ **06**

TURN OVER

c) (i) Find $L^{-1}\left[\log\left(\frac{s+1}{s-1}\right)\right]$ 08

(ii) Find $L^{-1}\left[\frac{s+2}{s^2-4s+13}\right]$

6. a) Solve $(D^2+3D+2)\, y = 2(t^2+t+1)$ with $y(0) = 2$ & $y'(0) = 0$. 06

b) Find the bilinear transformation which maps the points 0, i, -2i of z-plane onto the points -4i, ∞, 0 respectively of w-plane. Also obtain fixed points of the transformation. 06

c) Find Fourier sine integral of 08

$$f(x) = \begin{cases} x, & 0 < x < 1 \\ 2 - x, & 1 < x < 2 \\ 0, & x > 2 \end{cases}$$

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SE/INFT/Sem-III(CBSGS)/Data Structure & Algorithm Any.
Nov-16

Q.P. Code: 552301

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No.1 is Compulsory.
(2) Answer **any three** out of remaining questions.
(3) Assume suitable data if necessary.
(4) **Figures** to the **right** indicate full **marks.**

1. (a) Define Algorithm and write its properties. **3**
   (b) Write properties of B-Tree. **3**
   (c) Define minimum spanning trees with examples. **3**
   (d) What is Queue ADT ? Mention its operations. **3**
   (e) What is linked list ? Explain types of linked list. **3**
   (f) Define Recursion ? State its advantages and disadvantages. **3**
   (g) Explain linear and non-linear data structures. **2**

2. (a) Write a program to implement queue using arrays. **10**
   (b) Write an algorithm for insertion and traversal in a circular linked list. **10**

3. (a) Write a program to convert INFIX expression into POSTFIX expression. **10**
   (b) Write an algorithm to implement Heap-sort. Also comment on its complexity. **10**

4. (a) Define AVL Tree ? Construct AVL Tree for the following data (Mention type of rotation for each case) **10**
   10,40,30,20,70,50,45.
   (b) Write a program to implement Priority Queue. **10**

5. (a) Explain BFS and DFS algorithm with examples.

   (b) What is Binary Search-Tree ? Construct the Binary Search Tree for the following set of data :

   14, 10, 1, 20, 17, 24, 18, 12, 15, 11, 4, 6 .

6. Write short notes on **any four** of the following:-
   (1) Red-black Trees
   (2) Searching Algorithms
   (3) Adjacency list and Adjacency matrix
   (4) Euclid's Algorithm
   (5) Expression Trees
   (6) Asymptotic Notations.

E|INFT|SEM-III (CBSGS)|Principles of Analog & Digital Communition|Nov-16

Q.P. Code : 552200

(3 Hours) **[Total Marks : 80]**

Note: 1) Question **No.1** is **compulsory.**
2) Out of remaining attempt **any three**.
3) Assume & mention suitable data wherever required.
4) **Figures** to **right** indicates **full marks.**

1. Attempt **any four** from the following. **20**
   (a) An amplifier has a bandwidth of 4 MHz with 10 K as the input resistor. Calculate the rms noise voltage at the input to this amplifier, if the room temperature is 25°C.
   (b) Explain Eye pattern with neat diagram.
   (c) Explain Quantization.
   (d) State and prove the differentiation in time domain property of the Fourier Transform.
   (e) What is diagonal clipping and explain how it can be avoided.

2. a) The AM Transmitter develops an unmodulated power o/p of 400 Watts across a 50 ohms resistive load. The carrier is modulated by a sinusoidal signal with a modulation index of 0.8. Assuming fm= 5KHz and fc= 1MHz. **10**
   (i) Obtain the value of carrier amplitude Vc and hence write the expression for AM signal.
   (ii) Find the total sideband power.
   (iii) Draw the AM wave for the given modulation index.

   b) Explain any one generation method of SSBSC AM. **10**

3. a) Derive the mathematical expression for FM. **10**
   b) Explain Foster seeley descriminator with neat block diagram and compare the performance with Ratio detector. **10**

4. a) State and prove Sampling theorem and explain the aliasing error. **10**
   b) Explain generation and demodulation of PPM. **10**

5. a) Explain the Delta modulator Transmitter and receiver with neat block diagrams. **10**
   b) The binary data 11010101 is transmitted over a baseband channel. Draw the waveform for transmitted data using the following data formats. **10**
   (i) Unipolar NRZ (ii) Unipolar RZ (iii) Bipolar RZ (iv) Split phase Manchester (v) Polar quaternary NRZ.

[TURN OVER

6. Answer **any four** 20

(a) Explain wired communication channel.

(b) Derive Friss formula.

(c) Explain QPSK.

(d) Compare TDM and FDM.

(e) Explain BFSK Transmitter.

E/INFT/Sem-III (CBSGS)/Database Management Systems/NOV-16

Q. P. Code : 552502

(Time: 3 Hrs) **Marks: 80**

N.B. : 1. Question no. 1 is **compulsory**.
2. Solve any **Three** questions out of remaining **Five** questions.

Qu-1	a)	Explain generalization and specialization.	5
	b)	Describe ACID Properties.	5
	c)	Explain Total participation and Partial participation with example.	5
	d)	Explain aggregate functions with example.	5
Qu-2	a)	Explain Shadow Paging.	10
	b)	Explain different integrity constraints.	10
Qu-3	a)	Draw an E-R diagram for University database consisting of four entities: Student, Department, Class, Faculty. Student has unique id, student can enroll for multiple classes and has at most one major. Faculty must belong to department and faculty can teach multiple classes. Each class is taught by only one faculty. Every student will get grade for the class he/she enrolled.	10
	b)	Explain conflict and View Serializability with example.	10
Qu-4	a)	Describe BCNF and 4NF in detail.	10
	b)	Explain any 2 concurrency protocols in database systems.	10
Qu-5	a)	Explain any four relational algebra operators with example.	10
	b)	Explain cost based query optimization.	10
Qu-6	a)	Explain deadlock with wait-for-graph.	10
	b)	What is system catalog and meta data?	10

E/INFT/Sem-III (CBSGS)/Analog & Digital Circuits/NOV-16

QP Code :552400

(3 Hours) **[Total Marks:80**

N.B.: (1) Question No. **1** is **compulsory.**
(2) Solve any **three** questions out of remaining **five.**
(3) Figures to **right** indicate **full** marks.
(4) Assume suitable **data** where **necessary.**

1. Attempt any five out of six questions (20)
   a) What are the various regions that a transistor can operate? In which region can a transistor be operated if it is used as a switch?
   b) Give some applications of OpAmp and explain the block diagram of Op Amp.
   c) Explain the working of LCD.
   d) Minimize the following boolean expression wsing K-map

$$F(A,B.C,D) = \sum m(0,3,7,11,15) + d(1,2,5)$$

   e) Draw the truth table and excitation table for S-R flip flop.
   f) Convert $(101101.1101)_2$ to decimal, octal and hexa decimal.

2 a) What is the need for biasing? Explain voltage divider bias and locate the Q points (10)
   b) Draw the truth table for full adder and realize using 3:8 decoder (10)

3 a) Explain the working of Monostable Multivibrator using IC555. Draw the waveforms and give its applications (10)
   b) Design and implement one digit BCD adder using IC- 7483. (10)

4 a) Design and implement binary to gray code converter (10)
   b) Realize the following expression using only one 8:1 MUX and few logic gates (05)

$$F(A,B,C,D)=\sum m(0,3,6,8,11,13,15)$$

   c) Explain the practical differentiator circuit using op-Amp. (05)

5 a) Explain differential amplifier and elaborate on any one method to improve the CMRR (10)
   b) Design a half adder using VHDL (05)
   c) Design mod-3 up counter using JK Flip Flop (05)

6 Write short notes on any four (20)
   a) Bidirectional shift registers
   b) Full subtractor
   c) Basic Logic Gates
   d) BCD and Excess-3 code
   e) JFET