S.E./SEM III - Rev.2012(CBSGS)/CMPN/MAY 2018

Applied Maths III

Q.P. Code :23005

[Time: Three Hours] **[Marks:80]**

Please check whether you have got the right question paper.

N.B: 1. Question no. 1 is compulsory.
2. Attempt any three of the remaining.
3. Figures to the right indicate full marks.

Q1 a) Find the Laplace transform of e^{-4t} sinh t sin t. 05

b) Find half-range sine series for f(x) = $\frac{\pi}{4}$ in (0, π). 05

c) Find the values of Z for which the following function is not analytic. 05
Z= sin hu cos v + i cos hu sinv.

d) Show that $\nabla\left[\frac{(\bar{a}\,.\,\bar{r})}{r^n}\right] = \frac{\bar{a}}{r^n} - \frac{n(\bar{a}\,.\,\bar{r})\bar{r}}{r^{n+2}}$, where $\bar{a}$ is a constant vector. 05

Q2 a) Find the inverse Z- transform of $F(z) = \frac{1}{(z-3)(z-2)}$ if $|z| < 2$. 06

b) Verify Laplace's equation for $u = \left(r + \frac{a^2}{r}\right)\cos\theta$ also find v and f(z). 06

c) Find the Fourier series for the periodic function 08

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

State the value of f(x) at x=0 and hence, deduce that

$$\sum_{n=1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$$

Q3 a) Find $L^{-1}\left[\frac{1}{(s-3)(s-3)^2}\right]$ using convolution theorem. 06

b) Show that the set of functions sin x , sin 2x , sin 3x, ---------- is orthogonal on the interval $[0,\pi]$ 06

c) Verify Green's Theorem for $\int_C \bar{F}\,.\,d\bar{r}$ where $\bar{F} = x^3i + xyj$ and c is the triangle whose vertices are (0,2) , (2,0) and (4,2) . 08

Q.4

a) Find Laplace transform of $f(t) = \begin{cases} a\ sinp\ t, & 0 < t < \frac{\pi}{p} \\ 0, & \frac{\pi}{p} < t < \frac{2\pi}{p} \end{cases}$ and $f(t) = f\left(t + \frac{2\pi}{p}\right)$. 06

b) Show that $\bar{F} = (y^2-z^2+3yz-2x)i + (3xz+2xy)j + (3xy-2xz+2z)k$ is both solenoidal and irrotational. 06

c) Find half range cosine series for $f(x) = x$, $0<x<2$. 08
Hence deduce that $\frac{\pi^4}{90} = \frac{1}{1^4} + \frac{1}{2^4} + \frac{1}{3^4} + \frac{1}{4^4} + - - - - -$

Q.5

a) Show that $\iint_S (\nabla r^n).\, d\bar{s} = n(n+1) \iiint_V r^{n-2}\, dv$ using Gauss's Divergence theorem. 06

b) Find the Z-transform of $\{k^2 e^{-ak}\}$, $k \geq 0$. 06

c) (i) Find $L^{-1}\left[\frac{s^2+2s+3}{(s^2+2s+2)(s^2+2s+5)}\right]$ 08

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

Q.6

a) Use Laplace transform to solve, 06
$\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 8y = 1$ where, $y(0) = 0$, $y'(0) = 1$

b) Find the bilinear transformation which maps the points $z=\infty, i, 0$ onto the points $0, i, \infty$ respectively of w-plane. 06

c) Express the function $f(x) = \begin{cases} \frac{\pi}{2}, & for\ 0 < x < \pi \\ 0, & for\ x > \pi \end{cases}$ 08

for Fourier Sine Integral and Show that

$\int_0^\infty \frac{1-cos\pi w}{w} \sin wx\ dw = \frac{\pi}{2}$ when $0<x<\pi$

**********All THE BEST**********

S.E./SEM III (CBSGS) / CMPN / MAY 2018

Digital Logic Design & Analysis

Q.P.Code: 38996

(3 Hours) [Total Marks: 80]

N.B. (1) Question No. 1 is compulsory
(2)Assume suitable data if necessary
(3)Attempt any three questions from remaining questions

1

(a) Convert $(1473.45)_{10}$ into octal, binary and hexadecimal. (3)
(b) Add $(57)_{10}$ and $(26)_{10}$ in BCD. (3)
(c) Prove OR-AND configuration is equivalent to NOR-NOR configuration. (4)
(d) Subtract using 1's and 2's complement method $(15)_{10} - (21)_{10}$. (4)
(e) Encode the data bits 0 1 0 1 into a seven bit even parity Hamming code. (2)
(f) Prove NAND as universal gate. (2)
(g) Define a redundant group. (2)

2 (a) Given the logic expression: (10)

$AB + A\overline{C} + C + AD + A\overline{B}C + ABC$

1. Express in standard SOP
2. Draw the K-map for the equation
3. Minimize and realise using NAND gates only.

(b) Design 2-bit magnitude comparator. (10)

3 (a) Design a logic circuit to convert BCD to Gray code. (10)
(b) Implement a full adder using demultiplexer. (10)

4 (a) Compare different logic families with respect to fan in, fan out, speed, propogation delay and power dissipation. (5)
(b) Design 16:1 Multiplexer using 4:1 Multiplexer. (5)
(c) Explain 4 bit bidirectional shift register. (10)

5 (a) Design mod 12 asynchronous down counter. (10)
(b) Convert D flipflop to JK flipflop and SR flipflop. (10)

6 Write short note on (any four):- (20)
(a) Multivibrators
(b) VHDL
(c) Race around condition
(d) State table
(e) Ring Counter

S.E. Sem III (Rev. 2012) (CMPM) June 2018

Discrete Structure

QP CODE : 40418

(3 Hours) **Max. Marks: 80**

1) Question **No.1** is **compulsory.**
2) Solve any **three** questions out of remaining **five** questions.
3) **All** questions carry **equal** marks as indicated by figures to the right.
4) Assume appropriate data whenever required. State all assumptions clearly.

Q.1 a) Use mathematical induction to show that (05M)

$1+2+3...+n=n\ (n+1)/2$ for all natural number values of n.

b) Draw Hasse Diagram for following relation, what the diagram is called as? Justify.

Let A={a,b,c,d,e} and

R={(a,a),(b,b),(c,c),(d,d),(e,e),(a,b),(b,c)(c,d),(d,e),(a,c),(a,d),(a,e),(b,d),(b,e),(c,e)} (05M)

c) Let the universal set U={1,2,3,...,10}

Let A={2,4,7,9} B={1,4,6,7,10} and C={3,5,7,9}

Find 1) AUB 2)A$\cap$B 3) B$\cap$C 4) (A$\cap$B)UC 5)(BUC) $\cap$C (05M)

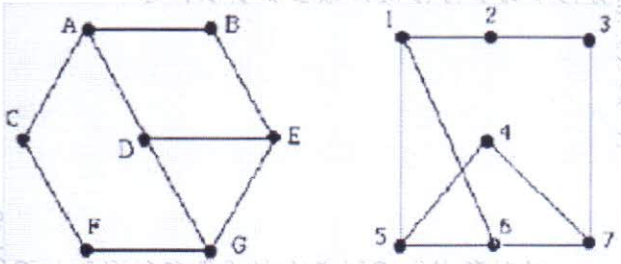
d) Consider set G = {1,2,3,4,5,6} under multiplication module 7 (05 M)

I. Find the multiplication table of the above.
II. Prove that it is a cyclic group

Q.2 a) Test whether the following function is one-to-one, onto or both. (04M)

$f: Z \rightarrow Z, f(x)=x^2+x+1$

b) Define Isomorphic Graphs. Find if the following two graphs are isomorphic. If yes give their one-to-one correspondence. (08 M)



c) Prove that set G = {0,1,2,3,4,5} is a finite abelian group of order 6 with respect to addition modulo 6. (08M)

Q.3 a) Explain Extended Pigeonhole Principle. How many friends must you have to guarantee that at least five of them will have birthdays in the same month. (04 M)

b) Show that the (3,6) encoding function $e:B^3 \rightarrow B^6$ defined by (08 M)

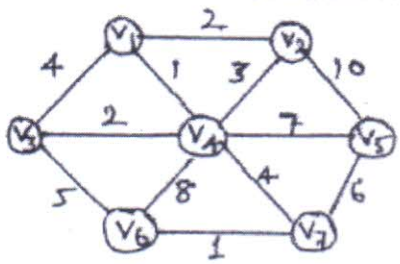
e(000)=000000 e(001)=000110
e(010)=010010 e(011)=010100
e(100)=100101 e(101)=100011
e(110)=110111 e(111)=110001 is a group code.

c) Let the functions f,g, and h defined as follows: (08 M)

f:R→R, f(x)=2x+3
g: R→R, g(x)=3x+4
h: R→R, h(x)=4x
Find gof, fog, foh, , gofoh

Q.4 a) Define R on Z as aRb iff (a-b) is a non-negative even integer. Check if R is a partially ordered relation. (04 M)

b) Find Minimum spanning tree for the following graph using Prim's Algorithm. (08 M)



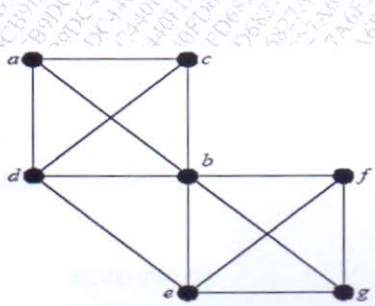
c) Solve $a_r - a_{r-1} - 6a_r = -30$ given $a_0 = 20$, $a_1 = -5$ (08 M)

Q.5 a) Find the generating function for the following finite sequences (04M)

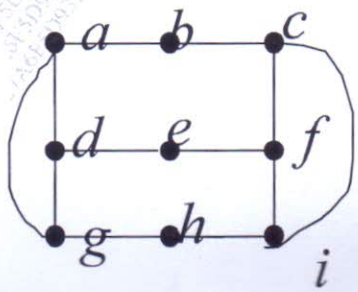
i) 2,2,2,2,2,2 ii) 1,1,1,1,1,1

b) i) Determine Hamiltonian Cycle and path in graph shown in (a) (08 M)

ii) Determine Euler Cycle and path in graph shown in (b)



(a)



(b)

d) State principle of inclusion and exclusion for three sets. A software company is looking to expand, anda firm is hired to help them find the necessary talent. The programmers must know the computer languages Java and Python. The firm receives 87 applications. Luckily, 75 applications indude knowledge of at least one of the languages. As it comes to pass, 48 applicants know Python, which is a good start, but 31 applicants do not know Java. How many people know both languages? Justify your answer with an appropriate Venn diagram. (08M)

Q.6 a) Prove pΛ (qVr) and (pΛ q)V(pΛr) are logically equivalent. (04M)

b) Let H=

$$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}$$

Be a parity check matrix. Determine the group code $e_H B^3 \rightarrow B^6$ (08 M)

c) Let G be a set of rational numbers other than 1. Let * be an operation on G defined by a*b=a+b-ab for all a,b €G. Prove that (G,*) is a group. (08 M)

S.E Sem III (CBSGS) (CHPN) May 2018.
Elect. Ckt & Comm. Fund.

Q.P. Code: 23887

Time:-3 Hrs **Marks: 80**

N.B. : 1. Question **ONE** is **compulsory**
2. Solve any **THREE** out of remaining questions
3. Draw neat and clean diagrams
4. Assume suitable data if required.

Q. 1. A. Find the mathematical expression of FM signal **5**

B. With neat diagram explain Zero-Crossing Detector **5**

C. A public address system is connected to a microphone that has a maximum output voltage of 10mV. The microphone is connected to a 10 watt audio amplifier system that is driving an 8 Ohm speaker. The voltage amplifier is a noninverting op-amp circuit. Calculate the maximum voltage gain for the voltage amplifier stage and determine the resistor values to obtain the desired gain. Assume the power amplifier stage has a voltage gain is 1. **5**

D. Explain lock range and capture range. **5**

Q. 2 A. Sketch a block representation for an n-channel JFET, showing bias voltages, depletion regions, and current directions. Label the device terminals and explain its operation. Explain the effect of increasing levels of negative gate-source voltage. Also sketch a typical drain characteristics for VGS=0 for an n-channel JFET. Explain the shape of the characteristic, identify the regions, and indicate the important current and voltage levels. **10**

B. List down various parameters of Opamp along with their typical values for IC741. Also explain what the significance of CMRR and Slew Rate is? **10**

Q. 3 A. Explain how operational amplifier can be used for taking summation of three signals. **5**

B. Explain fly wheel effect in Class C amplifier. **5**

C. Explain Nyquist criteria. **5**

D. Determine the magnitude of g_m for a JFET with I_{DSS} = 8 mA and V_P= −4 V at dc bias points V_{GS}= −0.5 V and also at V_{GS}= −2.5 V. **5**

Q. 4 A. What is DSBSC wave? Explain its generation using balanced modulator. **10**

B. Explain the use of PLL as FM detector. **10**

Q. 5 A. Explain super heterodyne receiver in detail along with the waveforms at each stage. **10**

B. What do you understand by signal multiplexing? Explain TDM and FDM with suitable examples. **10**

Q. 6 A. Write short note on generation of FM by Armstrong method. **5**

B. Mention important specifications of ADC and DAC required for communication. **5**

C. Explain in detail what is meant by quantization noise. **5**

D. Compare n-channel and p-channel JFET with respect to their device features and voltage-current characteristics. **5**