SE comp II Applied Maths-III 31 May 2014

(OLD COURSE) QP Code : **MV-17871**

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

NB 1. Question No.I is compulsory

2. Attempt any four from the remaining six questions

3. Figures to the right indicate full marks

Q1 a Find Fourier Series for $f(x)=x^2$ in $(-\pi,\pi)$ [20]

b Express the given matrix A= $\begin{bmatrix} -1 & 2+i & 5-3i \\ 2-i & 7 & 5i \\ 5+3i & -5i & 2 \end{bmatrix}$ as sum of Hermitian and Skew-Hermitian matrices.

c. Find Laplace Transform of $(e^t.\cos t)^2$

d Find Z transform of the sequence $f(k)=(1/3)^k, k\geq 0$

Q2 a Find Laplace Transform of $f(t)=\begin{cases} a\sin pt\ ;\ 0<t<\pi/p \\ 0 \quad\quad ;\pi/p<t<2\pi/p \end{cases}$, $f(t+2\pi/p)=f(t)$ [6]

b Reduce to normal form and find rank of A= $\begin{bmatrix} 1 & 3 & 5 & 7 \\ 4 & 6 & 8 & 10 \\ 15 & 27 & 39 & 51 \\ 6 & 12 & 18 & 24 \end{bmatrix}$ [6]

c Find Fourier Series of $f(x)=\begin{cases} x \quad\quad ;\ 0\leq x\leq \pi \\ 2\pi-x\ ;\ \pi\leq x\leq 2\pi \end{cases}$. Hence deduce that $\sum_{n=0}^{\infty}\frac{1}{(2n+1)^2}=\frac{\pi^2}{8}$ [8]

Q3 a Find Fourier Sine Integral of $f(x)=\begin{cases} \sin x & 0\leq x\leq \pi \\ 0 & x>\pi \end{cases}$ [6]

b Evaluate the integral $\int_0^{\infty}\frac{\sin^2 t.e^{-t}}{t}dt$ [6]

c For what value of k, the following equations are consistent?

$x-3y+2z=4,\ 2x+y-z=1,\ 3x-2y+z=k$. Solve the system completely [8]

[Turn Over

Q4 a Show that the functions $1, x, \frac{3x^2-1}{2}$ are orthogonal on (-1,1). [6]

b Find Inverse Laplace Transform using Convolution Theorem $\frac{s}{(s^2+a^2)(s^2+b^2)}$ [6]

c Find half range sine series of $f(x)=lx-x^2$ in $(0,l)$ and hence prove that

$$\frac{1}{1^6}+\frac{1}{3^6}+\frac{1}{5^6}+\ldots=\frac{\pi^6}{960}$$ [8]

Q5 a Find Inverse Z transform of $\frac{2z^2-10z+13}{(z-2)(z-3)^2}$, $2<|z|<3$ [6]

b Find non-singular matrices P and Q such that PAQ is in the Normal form of A.

Hence find Rank of $A=\begin{bmatrix}3 & 2 & -1 & 5\\ 5 & 1 & 4 & -2\\ 1 & -4 & 11 & -19\end{bmatrix}$ [6]

c Solve the Differential Equation using Laplace Transform

$y''+4y'+8y=1$ $y(0)=0, y'(0)=1$ [8]

Q6 a Find the Complex form of Fourier series of $\cosh 2x+\sinh 2x$ in [-2,2] [6]

b Show that the given vectors are Linearly Dependent and find the relation connecting them [6]

$X_1=(1\ \ 1\ \ 1\ \ 3), X_2=(1\ \ 2\ \ 3\ \ 4), X_3=(2\ \ 3\ \ 4\ \ 7)$

c Find Inverse Laplace Transform of the following functions

1) $\frac{e^{-2s}}{s^2+8s+25}$ 2) $\frac{s+2}{s^2-4s+13}$ [8]

Q7 a Determine a,b,c when $\frac{1}{3}\begin{bmatrix}a & b & c\\ -2 & 1 & 2\\ 1 & -2 & 2\end{bmatrix}$ is Orthogonal. Hence find Inverse of A. [6]

b Find $Z\{f(k)*g(k)\}$ if $f(k)=\frac{1}{3^k}, g(k)=\frac{1}{5^k}$ [6]

c Find Half Range Cosine Series for $f(x)=\sin x$ in $(0,\pi)$. Hence deduce that

$$\frac{1}{1\cdot 3}-\frac{1}{3\cdot 5}+\frac{1}{5\cdot 7}-\ldots\ldots=\frac{\pi-2}{4}$$ [8]

S.E Comp. Sem III Old May-14

Sub- EDLC

22|5|14

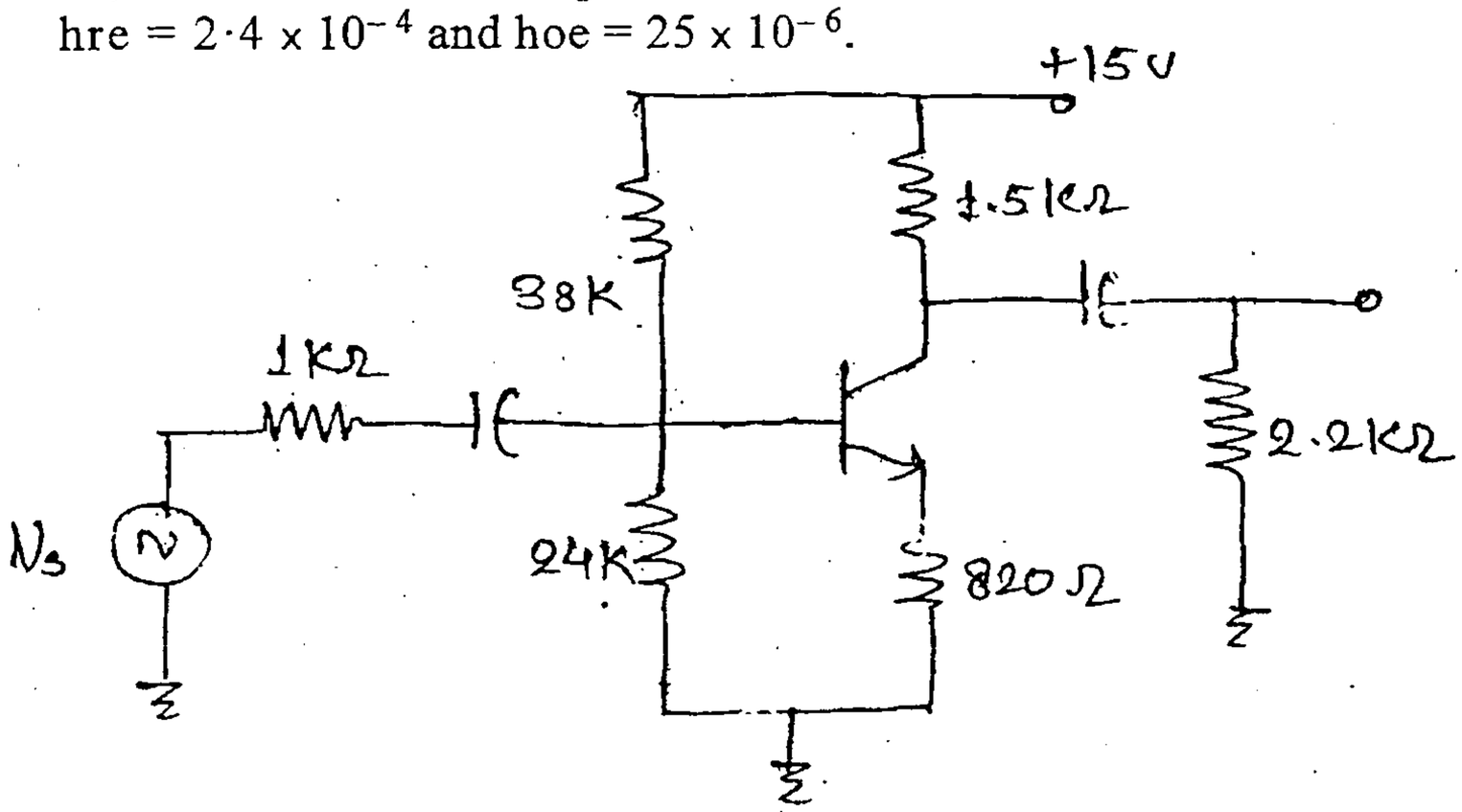
(OLD COURSE) QP Code : **MV-17901**

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

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

1. Attempt any **four** :— **20**
   (a) Explain virtual short and virtual ground concept.
   (b) What are the different stability factors of biasing circuits. ?
   (c) With the circuit diagram explain inverting summing Amplifier.
   (d) Explain why CE configuratioin is popular in amplifier circuit.
   (e) What is CMRR ? What are the various methods to improve CMRR ?

2. (a) With approximate analysis, for the amplifier shown in figure. Calculate the Ri, Ais and Avs. The h-parameters of the transistor are hie = 1 kΩ, hfe = 50, hre = $2 \cdot 4 \times 10^{-4}$ and hoe = 25×10^{-6}. **15**



   (b) How to calculate h-parameter using graphical method (only one method) ? **5**

3. (a) Explain how an op-amp can be used as :— **10**
   (i) Integrator (ii) Differentiator
   (b) Design a regulator using IC-723 to meet the following specifications :— **10**
   $V_0 = 5$ V $I_0 = 100$ mA
   $V_{in} = 15 \pm 20\%$ $I_{sc} = 150$ mA
   $V_{sense} = 0 \cdot 7$ V

4. (a) What are the requirements of instrumentation amplifier ? **12**
   Explain 3-op-amp Instrumentation amplifier and Drive the expression for voltage gain.
   (b) Explain the successive approximation type ADC. **8**

[TURN OVER

5. (a) Using IC555 design Astable multivibrator for frequency of 5 kHz and duty cycle of 70%. Draw the related waveforms. **10**
   (b) Draw the block digram of typical Op-amp. Explain function of each block. **6**
   (c) Explain the following terms for an op-amp : **4**
   (i) Slew Rate (ii) CMRR

6. (a) Explain constructiion and working of n-channel JFET, with the help of characteristic curves. **10**
   (b) Derive the equation for transconductance in terms of pinch-off voltage and saturation drain current. **5**
   (c) Compare BJT and JFET. **5**

7. Write a short note on :— **20**
   (a) Non-Inverting Schmitt trigger.
   (b) PLL.
   (c) Digital to Analog converter using R-2R Ladder.
   (d) Zero crossing detector.

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S.E. sem III old Comp. M-2014.
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(OLD COURSE) **QP Code : MV-18039**

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

N. B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **four** from questons No. **2** to 7.
(3) Draw suitable diagram, wherever necessary.
(4) Assume suitable data if required with justification.

1. (a) Explain Von-Neumman Machine. **10**
   (b) Explain Instruction cycle with different stages. **10**

2. (a) Explain Booth Algorithm and implement for the number (–7) and (+13). **10**
   (b) Explain Memory hierarchy and give various characteristics for 2-level memory hierarcy. **10**

3. (a) Draw Direct and set associative mapping for cache memory with advantages and disadvantages. **10**
   (b) Explain with flowchart floating-point addition/substraction algorithm. **10**

4. (a) Explain different Hardwired control unit design techniques. **10**
   (b) Explain Interrupt driven data transfer scheme. **10**

5. (a) Explain Flynn's classification scheme for parllel computer. **10**
   (b) Explain virtual memory with role of segmentation and paging. **10**

6. (a) Compare RISC & CISC. **10**
   (b) Explain ISA & PCI bus. **10**

7. Write note on following (any two) :– **20**
   (a) Interleaved Memory
   (b) Systollic processor
   (c) Addressing Modes with examples.

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(OLD COURSE) **QP Code : MV-17972**

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

N. B. : (1) Questions **no. 1** is **compulsory.**
(2) Solve **any four** questions out of the remaining.
(3) Figures to the right indicate **full marks.**
(4) Assume **suitable** data is **required.**

1. (a) Find binary, octal and hexadecimal equivalent for the following numbers **4**
(i) $(32)_{10}$ (ii) $(51)_{10}$
(b) Perform the following subtraction using TWO's complement method **4**
(i) $(11011)_2 - (1111)_2$ (ii) $(15)_{10} - (12)_{10}$
(c) Perform the following operation **4**
(i) $(53.23)_8 + (24.56)_8$ (ii) $(FFAB)_{16} + (9A57)_{16}$
(d) Express the following numbers in Gray code **4**
(i) $(25)_{10}$ (ii) $(11010111)_2$
(e) Universal Properties of NAND gates. **4**

2. (a) Explain the following characteristics with respect to logic families — Propagation Delay, Noise margin, Current parameters, Fan in and Fan out. **10**
(b) Draw a Two input TTL NAND gate circuit. Discuss the operation and draw its transfer characteristics. **10**

3. (a) Convert JK Flip Flop to T and SR Flip Flop to D. **10**
(b) Find the reduced logical expression using Quine McClusky method **10**
$F(A, B, C, D) = \Sigma m(0, 2, 4, 6, 7, 8, 10, 12, 14, 15)$

4. (a) For the following function find the reduced expression in SOP form and implement using NAND gates only **10**
$F(A, B, C, D) = \Sigma m(0, 1, 2, 3, 8, 9, 10, 11, 13, 15)$
(b) Design ful ladder using decoders. **10**

5. (a) Design a lockout free **Mod 8** Synchronous Up counter using MS-JK Flip Flops **10**
(b) Implement **10**
$F(A, B, C, D) = \Sigma m(0, 1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 15)$ using
(i) one 8 : 1 multiplexer
(ii) 4 : 1 multiplexers tree

[TURN OVER

6. (a) Design a Binary to Gray code converter 10
   (b) Design a two bit digital comparator and implement using minimum number of Gates. 10

7. Write short notes on: (any **four**) 20
   (i) Weighted and unweighted codes
   (ii) BCD adder
   (iii) Boolean Algebra
   (iv) Universal Shift Register
   (v) Asynchronous and Synchronous Sequential Circuits
   (vi) Race around condition in JK Flip Flop

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S.E. Comp Sem III Old M-2014

Sub- DS & GT.

(OLD COURSE) QP Code : **MV-18009**

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

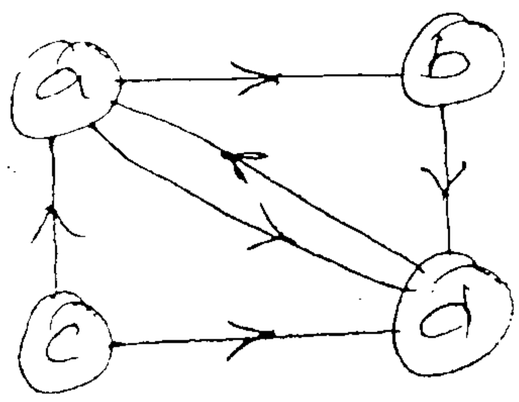
N.B. (1) Question no. **1** is **compulsory.**
(2) Attempt any **four** from the remaining **six** questions.
(3) **Figures** to the **right** indicate **full** marks.

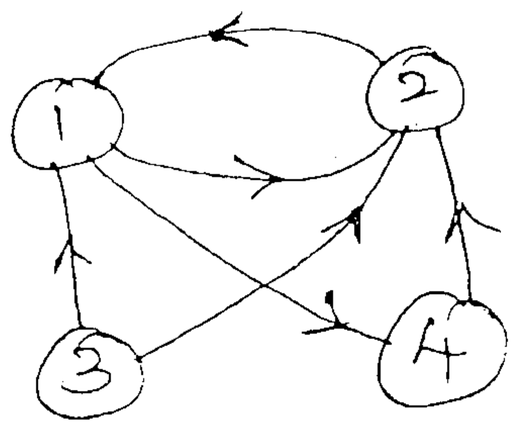
1. (a) Show that $A \times (B \cap C) = (A \times B) \cap (A \times C)$ **4**
(b) What is universal and existential quantifier ? Give example. **5**
(c) Using Mathematical Induction prove that $5^n - 1$ is divisible by 4 for $n >= 1$. **5**
(d) Among the integers 1 and 300 **6**
(i) How many of them are divisible by 3, 5 or 7 and are not divisible by 3 nor by 5 nor by 7 ?
(ii) How many of them are divisible by 3 but not by 5 nor by 7 ?

2. (a) Consider the set S = {1, 2, 3, 4} and a relation R on S given by R = { (4, 3), (2, 2), (2, 1), (3, 1) , (1, 2) } **10**
(i) Show that R is not transitive
(ii) Find transitive closure of R using Warshall's algorithm.
(b) Let R be a relation on set of real number such that a R b if and only if a-b is an integer. Prove that R is an EQUIVALENCE RELATION. **10**

3. (a) Show that all the divisors of 70 forms a lattice. **10**
(b) Draw the Hasse diagrams $D_4 \times D_9$ where D_n is the set of positive divisors of n. **6**
(c) Define the following terms with examples **4**
(i) Partial Order Relation
(ii) Antisymmetric Relation.

4. (a) Find the number of vertices of the graph having 16 edges if degree of each vertex is 2. **4**
(b) Check if the set A = {2, 4, 12, 16} is a lattice under divisibility. **4**
(c) Show that {0, 1, 2, 3, 4, 5} is an abelian group under the operation +6. **6**
(d) Define isomorphic graphs. Determine whether the given graphs are isomorphic. **6**





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5. (a) Define Bijective function with example. if $f : R \to R$ is defined as $f(x) = x^3$ and $g : R \to R$ is defined as $g(x) = 4x^2 + 1$ and $h : R \to R$ is defined as $h(x) = 7x - 1$. Find the rule of defining (i) (hog) of and (ii) go (hof). 8

(b) Show that if any five integers from 1 to 8 are selected, then the sum of atleast two of them will be 9. 4

(c) Show that $(I, \oplus, \otimes)$ is a commutative ring with identity where the operations $\oplus$ and $\oplus$ are defined as $a \oplus b = a + b - 1$ and $a \otimes b = a+b-ab$. 8

6. (a) Define the following with example : 6

(i) Ring homomorphism

(ii) Field

(iii) Spanning tree.

(b) Let $H = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ be a parity Check matrix. Decode the following words relative to maximum likelihood decoding function. 6

(i) 011001

(ii) 101011

(iii) 111010

(c) Show that the function $f : R - \{2\} \to R - \{0\}$ where R is set of real numbers defined by $f(x) = \frac{1}{x-2}$ is a bijection. Find its inverse. 8

7. (a) Find the generating function for the following sequences. **8**

   (i) 1, 1, 1, 1, 1, 1

   (ii) 2, 2, 2, 2, 2, 2

   (iii) 1, 1, 1, 1, ...

   (iv) 1, 0, -1, 0, 1, 0, -1, 0, ...

   (b) Solve the recurrence relation $d_n = 2d_{n-1} - d_{n-2}$ with initial conditions $d_1 = 1.5$ and $d_2 = 3$. **6**

   (c) Show that the lattice given in the following Hasse diagram are non distributive. **6**