

Q.P. Code : 4827

(3 Hours)

[ Total Marks : 80

- N.B.: (1) Question No.1 is compulsory.  
(2) Attempt any three from the remaining six questions.  
(3) Figures to the right indicate full marks.

Q1a Find Laplace Transform of  $\frac{\sin t}{t}$  [20]

b Prove that  $f(z) = \sinh z$  is analytic and find its derivative.

c Find Fourier Series for  $f(x) = 9 - x^2$  over  $(-3, 3)$

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

Q2 a Prove that  $\vec{F} = ye^{xy} \cos z i + xe^{xy} \cos z j - e^{xy} \sin z k$  is irrotational. Find Scalar Potential for  $\vec{F}$

Hence evaluate  $\int_C \vec{F} \cdot d\vec{r}$  along the curve C joining the points  $(0, 0, 0)$  and  $(-1, 2, \pi)$  [6]

b Find the Fourier series for  $f(x) = \frac{\pi - x}{2}$ ;  $0 \leq x \leq 2\pi$ . [6]

c Find Inverse Laplace Transform of i)  $\frac{s+29}{(s+4)(s^2+9)}$  ii)  $\frac{e^{-2s}}{s^2+8s+25}$  [8]

Q3 a Find the Analytic function  $f(z) = u + iv$  if  $u + v = \frac{x}{x^2 + y^2}$  [6]

b Find Inverse Z transform of  $\frac{1}{(z-1/2)(z-1/3)}$ ,  $1/3 < |z| < 1/2$  [6]

c Solve the Differential Equation  $\frac{d^2 y}{dt^2} + y = t$ ,  $y(0) = 1$ ,  $y'(0) = 0$ , using Laplace Transform [8]

Q4 a Find the Orthogonal Trajectory of  $3x^2y - y^3 = k$  [6]

b Using Greens theorem evaluate  $\int_C (xy + y^2) dx + x^2 dy$ , C is closed path formed by  $y = x$ ,  $y = x^2$  [6]

c Find Fourier Integral of  $f(x) = \begin{cases} \sin x & 0 \leq x \leq \pi \\ 0 & x > \pi \end{cases}$ . Hence show that  $\int_0^{\infty} \frac{\cos(\lambda\pi/2)}{1-\lambda^2} d\lambda = \frac{\pi}{2}$  [8]

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Q5 a Find Inverse Laplace Transform using Convolution theorem  $\frac{s}{(s^4 + 8s^2 + 16)}$  [6]

b Find the Bilinear Transformation that maps the points  $z = 1, i, -1$  into  $w = i, 0, -i$  [6]

c Evaluate  $\int_C \vec{F} \cdot d\vec{r}$  where C is the boundary of the plane  $2x + y + z = 2$  cut off by co-ordinate planes and  $\vec{F} = (x + y)i + (y + z)j - xk$ . [8]

Q6 a Find the Directional derivative of  $\phi = x^2 + y^2 + z^2$  in the direction of the line  $\frac{x}{3} = \frac{y}{4} = \frac{z}{5}$  at  $(1, 2, 3)$  [6]

b Find Complex Form of Fourier Series for  $e^{2x}; 0 < x < 2$  [6]

c Find Half Range Cosine Series for  $f(x) = \begin{cases} kx; & 0 \leq x \leq 1/2 \\ k(1-x); & 1/2 \leq x \leq 1 \end{cases}$ , hence find  $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$  [8]



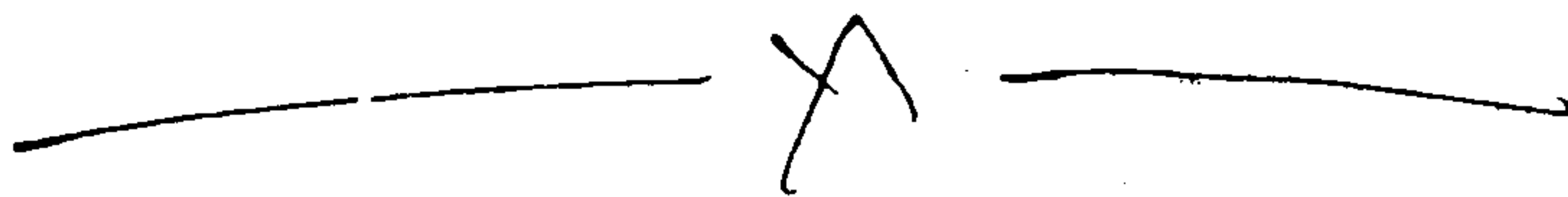
**QP Code : 4829**

**(3 Hours)**

**[Total Marks : 80**

- N.B. : 1. Question No. ONE is compulsory  
2. Solve any THREE out of remaining questions  
3. Assume suitable data if required

- Q1. Solve the following 20 Marks  
A. Draw and explain FET based Hartley and Colpitt Oscillator.  
B. Comment on the following ADC/DAC specifications  
I. Resolution  
II. Linearity  
III. Accuracy  
IV. Settling Time  
V. Stability.  
C. How is adaptive delta modulation superior to delta modulation?  
D. Discuss the factors that influence modulation index of an FM wave
- Q2. 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  $V_{GS}=0$  for an n-channel JFET. Explain the shape of the characteristic, identify the regions, and indicate the important current and voltage levels. 10 Marks  
B. Design an op-amp differentiator that will differentiate an input signal with  $f_{max}=100$  Hz. Draw the output waveform for a sine wave of 1 V peak at 100 Hz applied to the differentiator. Also repeat it for square wave input. 10 Marks
- Q3. A. Explain the different methods of biasing JFET along with their characteristics in detail. 10 Marks  
B. Explain any one technique used of conversion of analog signal to digital with ADC 05 Marks  
C. Draw and explain opamp inverting comparator. Draw input and output waveforms for  $V_{ref} > 0$  and also for  $V_{ref} < 0$ . 05 Marks
- Q4. A. Draw Foster Seeley Discriminator with circuit diagram and explain its working with phasor diagrams? 10 Marks  
B. What is DSBSC wave? Explain its generation using balanced modulator. 10 Marks
- Q5. A. Draw the PAM, PWM and PPM waveforms in time domain assuming a sinusoidal modulating signal. Explain them in brief. 10 Marks  
B. In an AM radio receiver the loaded Q of the antenna circuit at the input to the mixer is 100. If the intermediate frequency is 455 KHz, calculate the image frequency and its rejection at 1 MHz. 05 Marks  
C. With neat circuit diagram explain the use of PLL in frequency translator. 05 Marks
- Q6. A. What do you understand by signal multiplexing? Explain TDM and FDM with suitable examples. 10 Marks  
B. Draw the spectrum of an amplitude modulated wave and explain its components 05 Marks  
C. Compare class A and class C power amplifiers 05 Marks





SE- SEM III [CBGS] - ~~ETTS~~ comp 26 May 2015  
Data Structure

QP Code :4833

(3 Hours)

Total Marks: 80

- N.B.: (1) Question no. 1 is compulsory.  
(2) Attempt any three questions out of the remaining five questions.  
(3) Figures to the right indicate full marks.  
(4) Make suitable assumptions wherever necessary with justification.

- Q1 a) State differences between Singly Linked List and Doubly Linked List data structures along with their applications. 5  
b) What is a graph? Explain methods to represent a graph. 5  
c) What is binary search tree? Explain with an example. 5  
d) What is data structure? List out the areas in which data structures are applied extensively? 5
- Q2 a) Write a program in C to implement the quick sort algorithm 8  
b) Define traversal of binary tree. Explain different types of traversals of Binary tree with examples. 6  
c) Explain infix, postfix and prefix expressions with examples. 6
- Q3 a) What is a circular queue? Write a program in C to implement circular queue. 10  
b) Explain linear and non-linear data structures with examples. 5  
c) Explain the term recursion with an example. 5
- Q4 a) Write a C program to convert infix expression into postfix expression. 10  
b) What is an AVL tree? Construct AVL tree for the following data. 10  
Mention the type of rotation for each case.  
50, 25, 10, 5, 7, 3, 30, 20, 8, 15
- Q5 a) Write a C program to implement doubly linked list. 10  
Provide following operations.  
i) Insert at beginning  
ii) Insert at location  
iii) Remove from beginning  
iv) Remove from Location  
b) What is Indexed Sequential Search? Write program in C to implement it. 10
- Q6 a) What is heap? Consider the following list of numbers: 10  
15, 19, 10, 7, 17, 16  
Sort these numbers using heap sort.  
b) Explain Huffman Algorithm with an example 5  
c) What is a file? Explain various file handling operations in C. 5
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JP-Con.: 10645-15.

Q.P. Code : 4836

(3 Hours)

[ Total Marks : 80

- N.B. : (1) Question No. 1 is compulsory.  
(2) Assume suitable data if necessary.  
(3) Attempt any three questions out of the remaining five.

1. (a) Convert  $(121.2)_3$  into base 10. 2
- (b) Represent  $(52)_{10}$  into Excess - 3 code and Gray code. 2
- (c) Find the one's complement and two's complement of  $(57)_{10}$ . 2
- (d) Realize  $y = AB + \overline{AB}$  using NAND gates only. 2
- (e) Obtain hamming code for 1011. 2
- (f) Convert  $(126)_{10}$  to Octal, Hexcode. 2
- (g) State demorgans law. 2
- (h) Convert  $(214.32)_{10}$  to binary. 2
- (i) Perform binary subtraction using 2's complement for  $(62)_{10}$  and  $(99)_{10}$  4
  
2. (a) Minimize the logic function using Quine-McCluskey method.  
 $f(A,B,C,D) = \sum m(1,3,7,9,10,11,13,15)$  12
- (b) Implement the following expression using single 4:1 Mux.  
 $f = (A,B,C,D) = \sum m(0,1,2,4,6,9,12,14)$  8
  
3. (a) Design a 4-input (A,B,C,D) digital circuit that will give at its output (X) a logic 1 only if the binary number formed at the input is between 2 and 9 (including). 10
- (b) Simplify  $Y = \overline{(A + \overline{A}B)} \overline{(C + D)}$  5
- (c) Design 1 bit comparator using logic gates. 5
  
4. (a) Given the logic expression  
 $A + \overline{B}\overline{C} + AB\overline{D} + ABCD$  12
- (i) Express in standard SOP
- (ii) Draw K-map for the equation.
- (iii) Minimize and realize using NAND gates only.
- (b) Design 8 bit BCD adder. 8
  
5. (a) Design a mod 5 synchronous up counter using JK FF. 10
- (b) Convert SR FF to TFF and JK FF. 10
  
6. Write short note on (any three) 20
- (a) VHDL
- (b) Multivibrators
- (c) Gray code & Excess-3code
- (d) Johnson Ring Counter

- 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) Let  $A=\{a,b,c\}$ . Show that  $(P(A),\subseteq)$  is a poset. Draw its Hasse Diagram. (05M)

$P(A)$  is the power set of  $A$ .

b) Find the generating function for the following finite sequences (05M)

i) 1,2,3,4,... ii) 1,1,1,1,1,1

c) Is it possible to draw a tree with five vertices having degrees 1,1,2,2,4? (05M)

d) Prove  $p \wedge (q \vee r)$  and  $(p \wedge q) \vee (p \wedge r)$  are logically equivalent. (05M)

Q.2 a) If  $f:A \rightarrow B$  be both one-to-one and onto, then prove that  $f^{-1}: B \rightarrow A$  is also both one-to-one and onto. (04 M)

b) 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  $a, b \in G$ . Prove that  $(G, *)$  is a group. (08 M)

c) Define Equivalence relation with an example. Let  $m$  be a positive integer other than 1. Show that the relation  $R = \{(a,b) | a \equiv b \pmod{m}\}$  i.e.  $m$  divides  $a-b$  is an equivalence relation on the set of integers. (08 M)

Q.3 a) Show that the set of all divisors of 70 forms a lattice. (04 M)

b). Consider the (3,5) group encoding function defined by (08 M)

$e(000) = 00000$        $e(001) = 00110$

$e(010) = 01001$        $e(011) = 01111$

$e(100) = 10011$        $e(101) = 10101$

$e(110) = 11010$        $e(111) = 11000$

Decode the following words relative to a maximum likelihood decoding function.

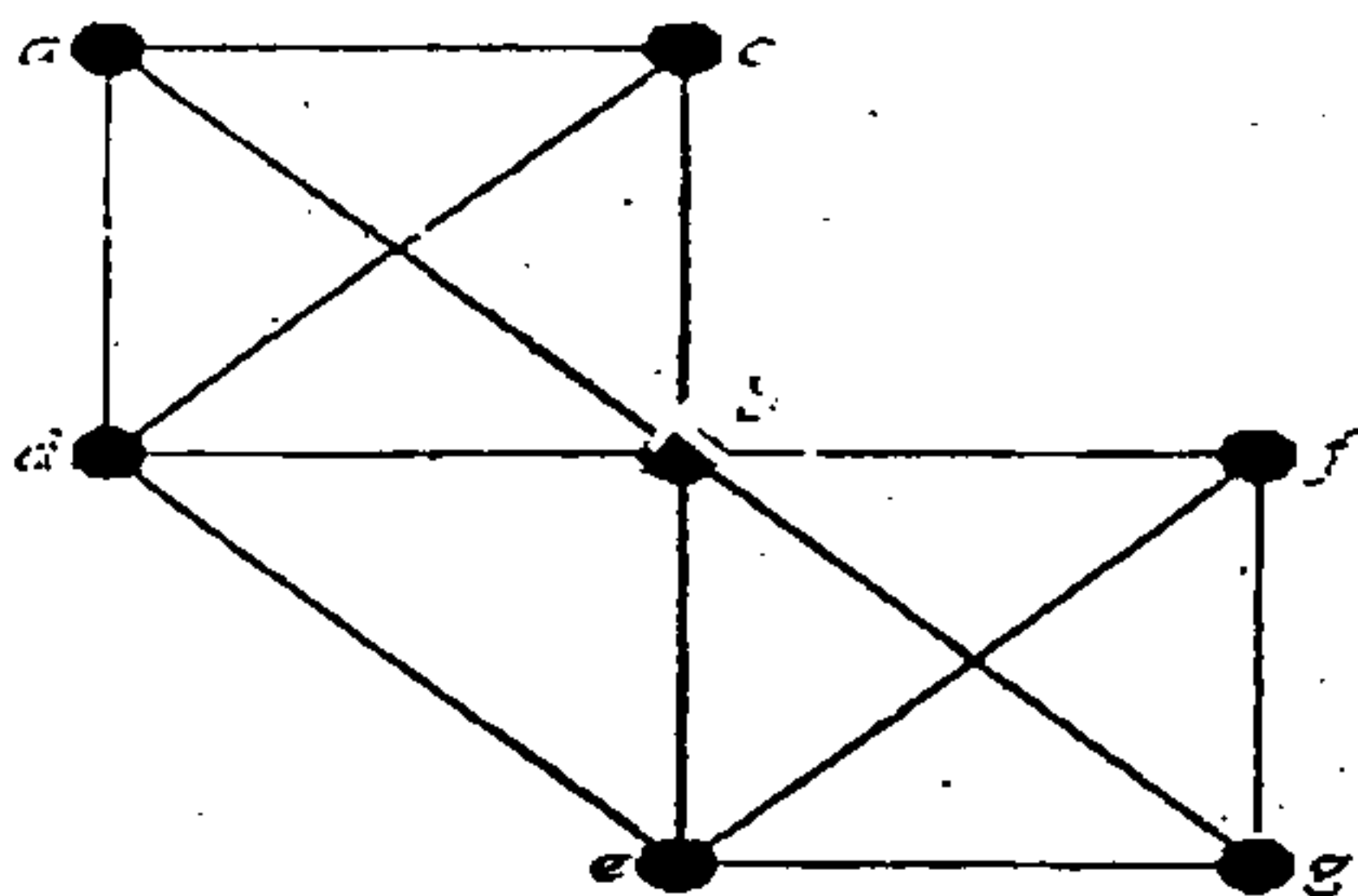
i) 11001    ii) 01010    iii) 00111

c) Define Reflexive closure, Symmetric closure along with a suitable example. Let  $R$  be a relation on set  $S = \{a,b,c,d,e\}$ , given as

$R = \{(a,a), (a,d), (b,b), (c,d), (c,e), (d,a), (e,b), (e,e)\}$

Find transitive closure using Warshall's Algorithm. (08 M)

Q.4 a) Determine Euler Cycle and path in graph shown below (04 M)



b) A survey of 500 television watchers produced the following information:

285 watch football games, 195 watch hockey games, 115 watch basket ball games, 45 watch football and basketball games, 70 watch football and hockey games, 50 watch basketball and hockey games. 50 do not watch any three kinds of games. Find: (08 M)

[TURN OVER



- i) How many in the survey watch all 3 kinds of games?  
 ii) How many watch exactly one of the sports languages?  
 iii) Draw Venn Diagram showing results of the survey.

c) Find the solution to the recurrence relation

(08 M)

$$a_n = 6a_{n-1} + 11a_{n-2} - 6a_{n-3} \text{ given } a_0 = 20, a_1 = 5 \text{ and } a_2 = 15$$

Q.5 a) Show that if every element in a group is its own inverse, then the group must be abelian. (04M)

b) Explain Pigeonhole principle and Extended Pigeonhole Principle. Show that if 7 colors are used to paint 50 bicycles, at least 8 bicycles will be of same color. (08M)

c) i) Prove by mathematical induction  $x^n - y^n$  is divisible by  $x - y$ . (04 M)

ii) Consider the group  $G = \{1, 2, 3, 4, 5, 6\}$  under multiplication modulo 7 (04 M)

a) Find multiplication table of G

b) Find inverse of every element

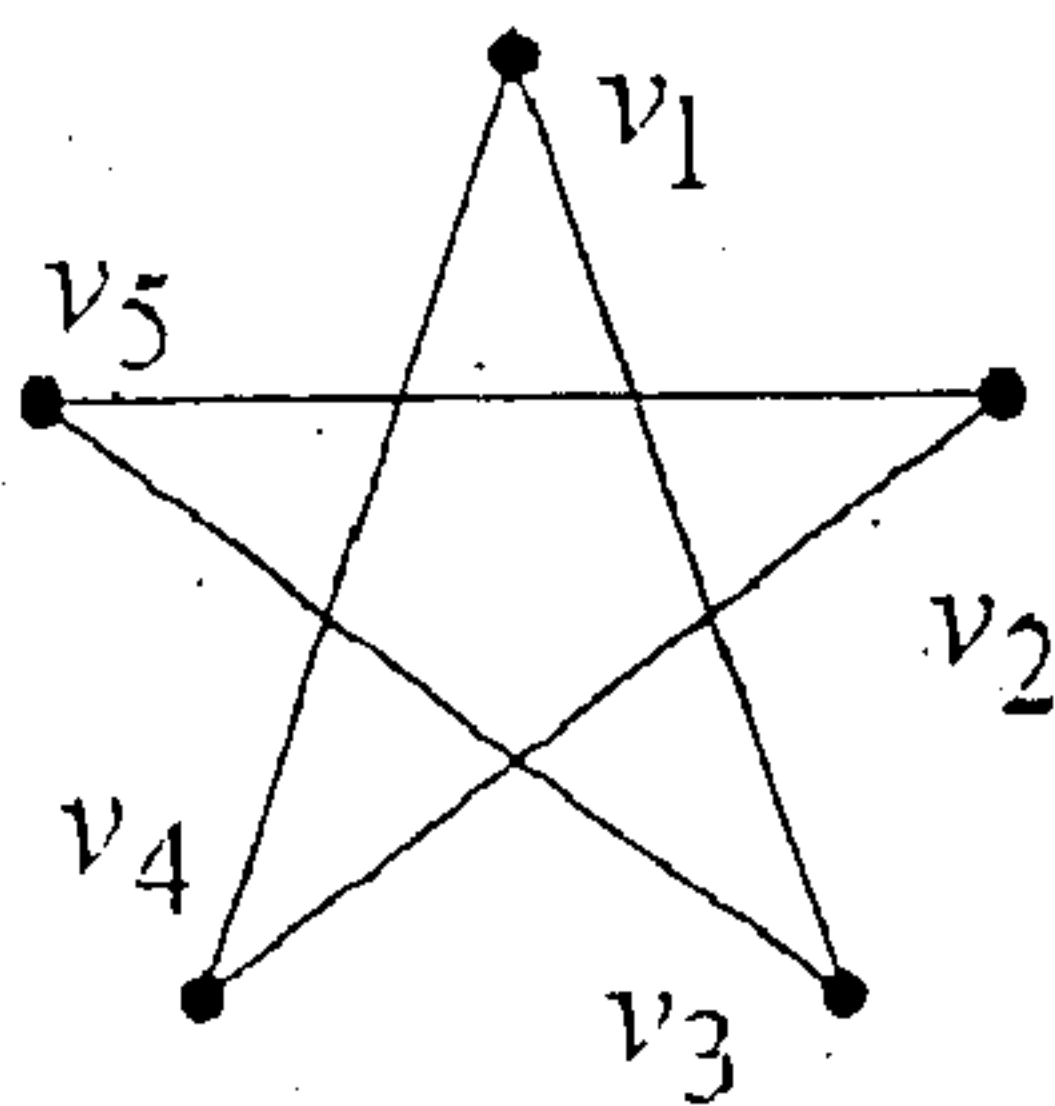
Q.6 a) Show that  $A - (B - C) = (A - B) \cup (A \cap B \cap C)$  (04 M)

b) Let  $H =$

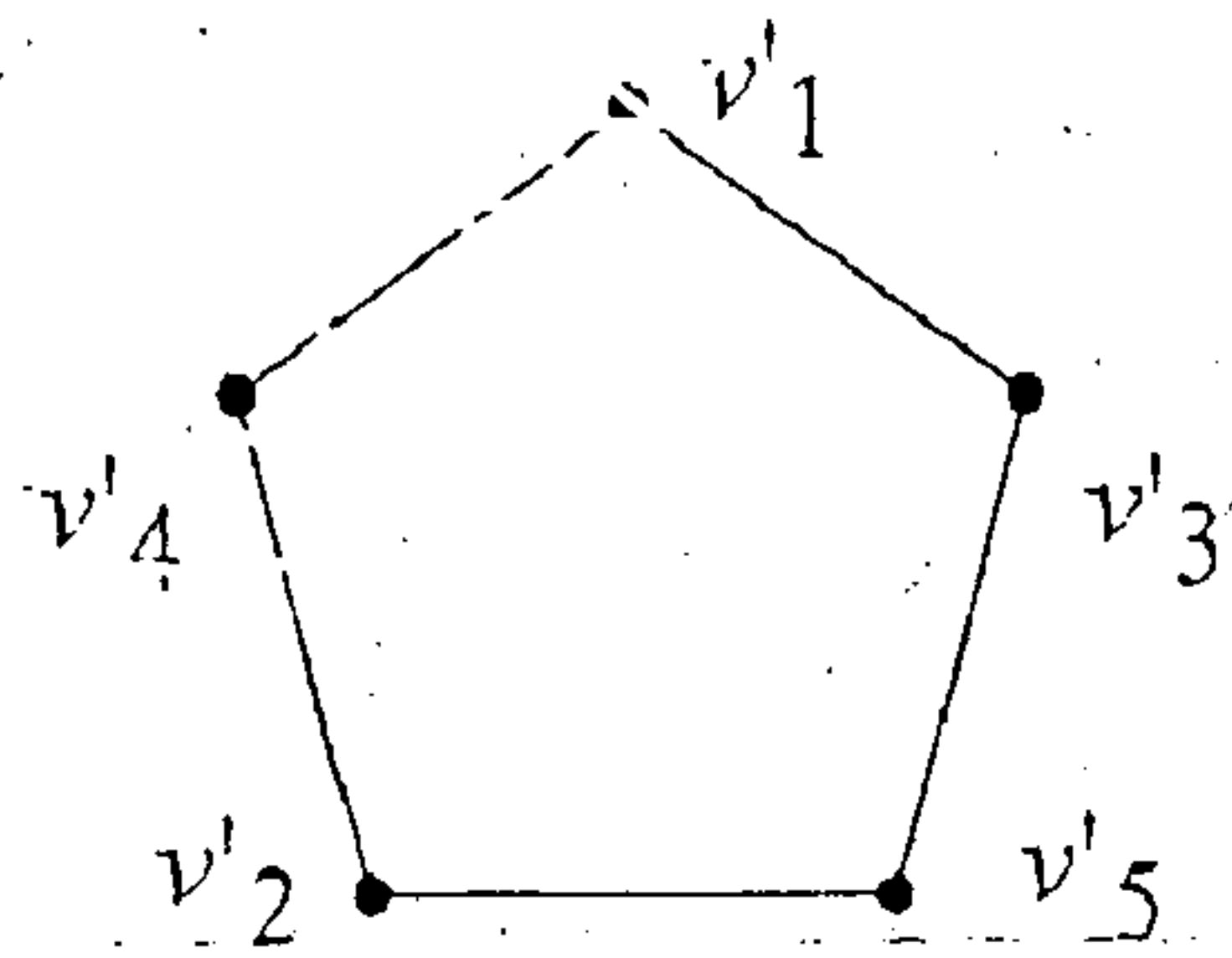
$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

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

c) Determine if following graphs  $G$  and  $G'$  are isomorphic or not. (08M)



$G$



$G'$

(Comp & IT) CBCS  
Sem III OOPM

11/6/2015

Q.P. Code : 4842

(3 Hours)

[ Total Marks : 80

N.B. : (1) Question No. 1 is compulsory.  
(2) Attempt any three from remaining.

1. (a) Write a program to calculate GCD of two numbers in JAVA. 5  
(b) Explain any three features of JAVA. 5  
(c) Draw and explain applet life cycle. 5  
(d) Explain wrapper class and its applications. 5
2. (a) Write a program in JAVA to display following pattern. (Take input for number of rows from command line) 5  
1  
1 2  
1 2 3  
1 2 3 4  
(b) Write a note on System.arraycopy ( ). 5  
(c) Identify classes and their attributes and draw the relationships specified by following problem. 10  
(i) Bank maintains two kinds of accounts for customer, Saving account & current account. Saving account provides compound interest and withdrawal facility. Current account provides cheque book facility but no interest.  
(ii) Library maintains books and magazines. A student can issue a book or return a book. A fine is charged if book is returned after 8 days. The magazines are not issued, but student can read it in library.
3. (a) What is a package ? Explain with example the steps to create package and add a class or an interface. 10  
(b) Write a program to create vector objects with student names. Program should perform following operations based on choice : 10  
(i) Add student name - To add new student name in the vector.  
(ii) Remove student name -Removes student name if already exists else display appropriate message.  
(iii) Display-Display contents of vector.
4. (a) What is Exception ? Explain how JAVA handles an Exception using following keywords : 10  
try, catch, throw, throws & finally

[TURN OVER



Q.P. Code : **4842**

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- (b) Write a program to read and display details of ten Employees with following specifications : 10  
Data Members : Emp\_ID, Emp\_name, Emp\_Salary  
Parameterized constructor to initialize data members of Employees and Member functions :  
Display () - to display information of all employees
5. (a) With the help of suitable example explain how threads are created in JAVA. 5  
(b) Explain multiple inheritance in JAVA with example 5  
(c) Write a program to count the number of alphabets, digits and special symbols from string. 10
6. Write short notes on (any **four**) 20  
(a) Method overloading & overriding  
(b) Static data members & methods  
(c) Abstract class & methods  
(d) Constructor & its type  
(e) JVM.
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