Sem IV CBGS Comp IT Maths
Comp
19/5/14

QP Code :**NP-19682**

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

N. B. : (1) Question no. **one** is **compulsory.**
(2) Answer **any three** questions from **Q.2** to **Q.6.**

1. (a) If $A = \begin{bmatrix} x & 4x \\ 2 & y \end{bmatrix}$ has eigen values 5 and –1 then find values of x and y. **5**

(b) Evaluate $\int_c (\bar{z} + 2z)\,dz$ along the circle c: $x^2 + y^2 = 1$. **5**

(c) State true or false with justification: If the two lines of regression are $x + 3y - 5 = 0$ and $4x + 3y - 8 = 0$ then the correlation coefficient is + 0.5. **5**

(d) Find dual of following LP model **5**

$\max z = 2x_1 + 3x_2 + 5x_3$

subject to

$x_1 + x_2 - x_3 \geq -5$

$x_1 + x_2 + 4x_3 = 10$

$-6x_1 + 7x_2 - 9x_3 \leq 4$

& $x_1, x_2 \geq 0$ and x_3 is unrestricted.

2. (a) Using Cauchy's integral formula, evaluate $\int_c \frac{(12z - 7)\,dz}{(z-1)^2(2z+3)}$ where **6**

C: $|z + i| = \sqrt{3}$.

(b) Determine whether matrix A is derogatory $A = \begin{bmatrix} 2 & 1 & 0 \\ 0 & 2 & 1 \\ 0 & 0 & 2 \end{bmatrix}$. **6**

(c) In a competitive examination, the top 15% of the students appeared will get grade 'A', while the bottom 20% will be declared fail. If the grades are normally distributed with mean % of marks 75 and S.D. 10, determine the lowest % of marks to receive grade A and the lowest % of marks that passes. **8**

3. (a) The daily consumption of electric power (in millions of kwh) is r.v. X with PDF $f(x) = k\,xe^{-x/3}$, $x > 0$. Find k and the probability that on a given day the electricity consumption is more than expected electricity consumption. **6**

[TURN OVER

(b) Using Simplex method, solve the following LPP 6

max $z = 15x_1 + 6x_2 + 9x_3 + 2x_4$

s.t. $2x_1 + x_2 + 5x_3 + 6x_4 \leq 20$

$3x_1 + x_2 + 3x_3 + 25x_4 \leq 24$

$7x_1 + x_4 \leq 70$

& $x_1, x_2, x_3, x_4 \geq 0$

(c) Obtain ALL Taylor's and Laurent's series expansions of function $\frac{(z-2)(z+2)}{(z+1)(z+4)}$ about $z = 0$. 8

4. (a) Find the moment generating function of Poisson distribution and hence find mean and variance. 6

(b) Obtain the equation of the line of regression of **cost on age** from the following table giving the age of a car of certain make and the annual maintenance cost. Also find maintenance cost if age of the car is 9 years. 6

Age of car (in years) : x	2	4	6	8
Maintenance cost : y (in thousands)	5	7	8.5	11

(c) Show that the matrix A is diagonalizable, find its diagonal form and transforming matrix, if $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$. 8

5. (a) A sample of 8 students of 16 years each shown up a mean systolic blood pressure of 118.4 mm of Hg with S.D. of 12.17 mm. While a sample of 10 students of 17 years each showed the mean systolic BP of 121.0 mm with S.D. of 12.88 mm during in investigation. The investigator feels that the systolic BP is related to age. Do you think that the data provides enough reasons to support investigator's feeling at 5% LoS? Assume the distribution of systolic BP to be normal. 6

(b) Using Cauchy's residue theorem, show that $\int_0^{2\pi} \frac{\cos 2\theta}{5 + 4\cos\theta}\, d\theta = \frac{\pi}{6}$. 6

(c) Using dual simplex method, solve 8

$$\max z = -2x_1 - x_3$$
$$\text{s.t. } x_1 + x_2 - x_3 \geq 5$$
$$x_1 - 2x_2 + 4x_3 \geq 8$$
$$\& \quad x_1, x_2, x_3 \geq 0$$

6. (a) A total of 3759 individuals were interviewed in a public opinion survey on a political proposal. Of them, 1872 were men and the rest were women. A total of 2257 individuals were in favour of the proposal and 917 were opposed to it. A total of 243 men were undecided and 442 women were opposed to the proposal. Do you justify on the hypothesis that there is no association between sex and attitude, at 5% LoS. 6

(b) Using Kuhn – Tucker's method solve 6

Maximize $Z = 2x_1^2 + 12x_1x_2 - 7x_2^2$

Subject to the constraints $2x_1 + 5x_2 \leq 98$ and $x_1, x_2 \geq 0$

(c) (i) Average mark scored by 32 boys is 72 with standard deviation of 8 while that for 36 girls is 70 with standard deviation of 6. Test at 1% LoS whether the boys perform better than the girls. 4

(ii) If the first four moments of a distribution about the value 4 of the random variable are –1.5, 17, –30 and 108 then find first four raw moments. 4

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SE Sem IV comp (CBGS) AOA

23/05/2014

QP Code :NP-19722

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

N.B. : (1) Solve any **four** from **six** questions.
(2) Assume suitable data wherever required.

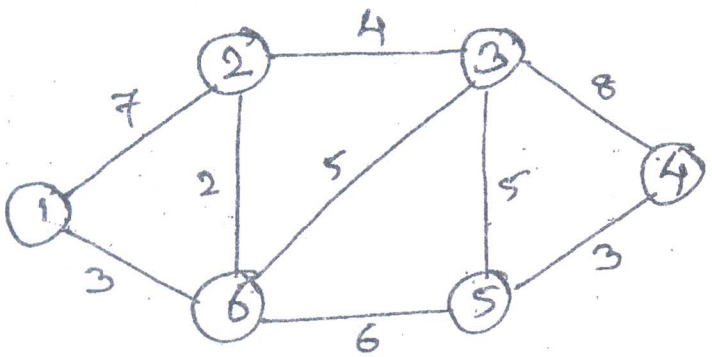
1. (a) Explain O, Ω and θ Notations with the help of Graph. And represent the following function using above notations. **10**
   (i) $T(n) = 3n + 2$
   (ii) $T(n) = 10n^2 + 2n + 1$
   (b) Explain 0/1 Knapsack Problem with example. **10**

2. (a) Write an algorithm of sum of subsets. Solve folibwing problem and draw portion of state space tree M = 35, W = (5, 7, 10, 12, 15, 18, 20). **10**
   (b) Explain longest common subsequence with example. **10**

3. (a) Explain all pair shortest path algorithm with suitable example. **10**
   (b) Explain different string matching algorithms. **10**

4. (a) Write a Min Max function to find minimum and maximum value from given set of values using divide and conquer. Also drive its complexities. **10**
   (b) Comment on any two modules of computation. **10**

5. (a) To find Dijkstra's shortest path from vertex 1 to vertex 4 for following graph. **10**



   (b) Explain flow shop scheduling with example. **10**

6. Write note on :— (any **two**) **20**
   (a) Job sequencing with deadlines
   (b) Randomized Algorithm
   (c) The 15 Puzzle Problem
   (d) N-Queen Problem.

Con. 12215-14.

Sem IV (Comp/IT)(Rev) 29/05/14

COA

QP Code :NP-19761

(3 Hours) [Total Marks :80

N.B.:— (1) Question no.1 is **compulsory.**
(2) Solve any **three** questions out of remaining **five** questions.
(3) Assume suitable data if **necessary.**
(4) Answer to **each** new question to be started on a **fresh page.**

1. (a) What is stored program concept? 3
   (b) Show IEEE 754 Standards for Binary Floating-Point Representation for 32 bit single format and 64 bit double format. 3
   (c) What are applications of Microprogramming? 3
   (d) What is Virtual Memory? 4
   (e) Explain in brief function of 8089 I/O Processor. 4
   (f) Name the Flynn`s Classification of Parallel Processing Systems. 3

2. (a) Draw the flow chart for Booth`s Algorithm for Twos Complement Multiplication. 5
   Using Booth`s Algorithm show the multiplication of 7x5. 7
   (b) Explain with diagram functioning of Microprogrammed Control Unit. 8

3. (a) What are the differences between RISC and CISC processors? 5
   (b) Describe hardwired control unit and specify its advantages. 7
   (c) What are characteristics of memory devices? 8

4. (a) Explain in details Memory Hierarchy with examples. 6
   (b) What are elements of cache design? Explain in details. 8
   (c) What are major requirements for an I/O module? 6

5. (a) Explain the DMA based data transfer techniques for I/O devices. 8
   (b) Explain concepts of nanoprogramming. 6
   (c) What is instruction pipelining? 6

6. Write short notes on:
   (a) Touch Pad 7
   (b) L1, L2 and L3 Cache memory. 7
   (c) Programmed I/O 6

S.E. (COMP.), Sem. IV (CBSGS)

04/06/201

DMS.

QP Code :NP-19797

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Solve any **three** questions from the **remaining** questions.
(3) Make **suitable** assumptions if **needed**.

1. (a) List four significant differences between file processing system and database management system. **5**
   (b) Explain shadow page recovery. **5**
   (c) Explain the terms . total participation' and . partial participation' with example. **5**
   (d) Explain lossless join decomposition and dependency preserving decomposition. **5**

2. (a) Explain conflict serializability and view serializability with examples. **10**
   (b) Construct an ER diagram and relational model for hospital with a set of patients and a set of medical doctors. Patients are treated in a single ward by the doctors assigned to them. Each patient will be treated by a single doctor. Healthcare assistants also attend to the patients, a number of these are associated with each ward. Patient undergoes various tests. Accounts department manages patient treatment bill and staff payment. Some staff are paid part time and doctors and care assistants work varying amounts of overtime at varying rates (subject to grade). **10**

3. (a) What is an attribute ? Explain different types of attributes with examples. **10**
   (b) Write SQL queries for the given database. **10**
   Sailor(sid, sname,rating,age)
   Boat(bid, bname, color)
   Reserves(sid, bid,date)
   (i) Find the names of sailors who have reserved 'red' boat.
   (ii) Find the sailor (name) with highest rating.
   (iii) Find the average age of sailor.
   (iv) Find the age of youngest sailor for each rating level.
   (v) Add the new boat to the database. Assume any values for required attributes.

4. (a) Explain the term super key, primary key, candidate key and foreign key giving suitable examples. **10**
   (b) What is normalization ? Explain 1NF, 2 NF, 3NF, BCNF with suitable examples. **10**

5. (a) Explain domain constraints and referential integrity constraints. **10**
   (b) Explain sort-merge join algorithm in query processing. **10**

6. (a) Explain following relational algebra operations with examples :— **10**
   (i) set intersection. (iii) Natural Join
   (ii) Generalized projection (iv) Division operator
   (b) Describe the overall architecture of DBMS with suitable diagram **10**

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Con. 13005-14.

Sem IV comp dld Maths 19/5/14

(OLD COURSE) QP Code : **MV-18804**

(3 Hours) [Total Marks : 100

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

1. (a) Find k such that 5

$$\frac{1}{2}\log\left(x^2+y^2\right)+i\tan^{-1}\frac{kx}{y} \text{ is analytic}$$

(b) If $A=\begin{bmatrix}1 & 0\\ 2 & 4\end{bmatrix}$ then find the Eigen values of $4A^{-1}+3A+2I$. 5

(c) Consider the following problem : 5

Maximise $z=x_1-2x_2+4x_3$
Subject to $x_1+2x_2+3x_3=7$
$3x_1+4x_2+6x_3=15$
and $x_1, x_2, x_3 \geq 0$

(d) Evaluate $\int_C \frac{\sin^6 z}{\left(z-\frac{\pi}{6}\right)^3}dz$ where c is $|z|=1$ 5

2. (a) Evaluate $\int_0^{1+i} z^2 dz$ along the line $x=y^2$ 6

(b) Find the Eigen values and Eigen vectors of the matrix. 6

$$A=\begin{bmatrix}8 & -8 & -2\\ 4 & -3 & -2\\ 3 & -4 & 1\end{bmatrix}$$

(c) Solve by penalty (Big-M) method 8

Minimise $z=2x_1+x_2+3x_3$
Subject to $3x_1+x_2-2x_3\geq 1$
$x_1-2x_2-x_3\geq 2$
and $x_1, x_2, x_3 \geq 0$

[TURN OVER

3. (a) Solve the following LPP by simplex method 6

Maximise $z = x_1 - 3x_2 + 2x_3$

Subject to $3x_1 - x_2 + 2x_3 \leq 7$

$2x_1 - 4x_2 \geq -12$

$-4x_1 + 3x_2 + 8x_3 \leq 10$

and $x_1, x_2, x_3 \geq 0$

(b) Compute $A^9 - 6A^8 + 10A^7 - 3A^6 + A + I$ 6

Where $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 3 & 1 \\ 1 & 0 & 2 \end{bmatrix}$

(c) Obtain Taylor's and Laurent's expansions of $f(z) = \frac{2}{(z-1)(z-2)}$ indicating regions of convergenes. 8

4. (a) Use the dual simplex method to solve the following : - 6

Minimise $z = 2x_1 + 2x_2 + 4x_3$

Subject to $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 \leq 3$

$x_1 + 4x_2 + 6x_3 \leq 5$

and $x_1, x_2, x_3 \geq 0$

(b) If $v = 3x^2y + 6xy - y^3$, show that v is Harmonic and find the corresponding analytic function. 6

(c) Show that 8

$A = \begin{bmatrix} 7 & 4 & -1 \\ 4 & 7 & -1 \\ -4 & -4 & 4 \end{bmatrix}$ is derogatory.

5. (a) If $A = \begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$ 6

prove that $A^{50} = \begin{bmatrix} -149 & -150 \\ 150 & 151 \end{bmatrix}$

(b) Find the Bilinear transformation which maps the points $z = \infty, i, 0$ on to the points $w = 0, i, \infty$ 6

(c) Solve by using Lagrange's multiplier method the following N.L.P.P. 8

Optimise $Z = 2x_1^2 + x_2^2 + 3x_3^2 + 10x_1 + 8x_2 + 6x_3 - 100$

Subject to $x_1 + x_2 + x_3 = 20$

and $x_1, x_2, x_3 \geq 0$

6. (a) Construct the dual of the following LPP 6

Maximise $z = 2x_1 - x_2 + 4x_3$

Subject to $x_1 + 2x_2 - x_3 \leq 5$

$2x_1 - x_2 + x_3 \leq 6$

$x_1 + x_2 + 3x_3 \leq 10$

$4x_1 + x_3 \leq 12$

and $x_1, x_2, x_3 \geq 0$

(b) Using the Residue Theorem, 6

Evaluate $\int_c \frac{z^2}{(z-1)^2(z+1)} dz$,

Where c is the circle $|z| = 2$

(c) Show that the matrix 8

$$A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$$

is diagonisable. Find the transforming matrix and the diagonal matrix.

7. (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{5+3\sin\theta}$ 6

(b) If $f(z) = u + iv$ is analytic and $u - v = e^x(\cos x - \sin y)$, find $f(z)$ in terms of z. 6

(c) Use the Kuhn - Tucker conditions to solve the following N.L.P.P. 8

Maximise $Z = 2x_1^2 - 7x_2^2 + 12x_1x_2$

Subject to $2x_1 + 5x_2 \leq 98$

and $x_1, x_2 \geq 0$

SE sem IV comp (old) DBMS

23/05/2014

(OLD COURSE) QP Code :**MV-18837**

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

N. B. : (1) Questions **No.'1** is **compulsory.**
(2) Out of remaining six questions attempt **any four** questions.
(3) In all **five** questions to be attempted.
(4) All questions carry **equal marks.**
(5) Answer to each new question to be started on fresh page.

1. (a) Consider a MOVIE database in which data is recorded about the movie industry. The data requirements are summarized as follows: **10**
   - Each movie is identified by title and year of release. Each movie has a length in minutes. Each has a production company, and each is classified under one or more genres (such as horror, action, drama, and so forth). Each movie has one or more directors and one or more actors appear in it. Each movie also has a plot outline. Finally, each movie has zero or more quotable quotes, each of which is spoken by a particular actor appearing in the movie.
   - Actors are identified by name and date of birth and appear in one of more movies. Each actor has a role in the movie.
   - Directors are also identified by name and date of birth and direct one or more movies. It is possible for a director to act in a movie (including one that he or she may also direct).
   - Production companies are identified by name and each has an address. A production company produces one or more movies.

   (i) Draw ER diagram according to the above requirements.
   (ii) Convert the ER diagram into equivalent schema.

   (b) Explain the following terms with example. **10**
   (i) Weak Entity Set
   (ii) Project operator in relational algebra
   (iii) Foreign Key
   (iv) Right outer join
   (v) DML

2. (a) **employee** (employee-name, street, city) **10**
   works (employee-name, company-name, salary)
   company (company-name, city)
   manages (employee-name, manager-name)
   (i) Create relations employee and works.

(ii) Add a new employee to the database; assume any values for required attributes.

(iii) Delete the works details for the employee "Sachin Parkar".

(iv) Find all employees in the database who do not work for State Bank of India.

(v) Find the company that has the most employees.

(b) Explain the database system architecture. 10

3. (a) **employee** (person-name, street, city) 10
works (person-name, company-name, salary)
company (company-name, city)
manages (person-name, manager-name)
Solve the following Queries using relational algebra:

(i) Modify the database so that "Sachin" now lives in "Agra"

(ii) Find the names, street address, and cities of residence of all employees who work for ICICI and earn more than Rs. 10,000 per month.

(iii) Find the company with the smallest payroll.

(iv) Find the names of all employees in this database who do not work for ICICI Bank.

(v) Find the company name which is in Mumbai.

(b) Explain Conflict Serializability with example. 10

4. (a) (i) Compute the closure of the following set F of functional dependencies for relation schema R = (A, B, C, D, E). 5

$A \rightarrow BC$
$CD \rightarrow E$
$B \rightarrow D$
$E \rightarrow A$

List the candidate keys for R.

(ii) Explain Third Normal Form and BCNF with example. 5

(b) Explain B+ tree with examples of various operation (insertion, deletion). 10

5. (a) Explain timestamp ordering protocol 10

(b) Consider the following two transactions: 10

```
T31:read(A);
read(B);
if A = 0 then B: = B + 1;
write (B);

T32:read(B);
read(A);
if B = 0 then A: = A + 1;
write (A);
```

Add lock and unlock instructions to transactions T31 and T32, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock?

6. (a) Explain Immediate database modification technique for log based recovery. 10
   (b) Explain what is deadlock and methods for deadlock detection. 10

7. Write short notes for: (any **four**) 20
   (i) Referential Integrity
   (ii) Aggregate functions in SQL
   (iii) Shadow Paging
   (iv) Checkpoints
   (v) Triggers in SQL

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Sem IV Comp (old) 29/05/14.

C.Gr.

(OLD COURSE) **QP Code : MV-18876**

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

N.B. (1) Question No. **1** is **compulsory.**
(2) Attempt any **four** questions from Questions Nos. **2** to **7.**
(3) Assume suitable **data** if **necessary.**

1. (a) Write Boundary fill procedure to fill an 8 connected region. **5**
   (b) Prove that two successive rotations are additive. $R(\theta 1).R(\theta 2) = R(\theta 1 + \theta 2)$. **5**
   (c) Write short note on Text Clipping Methods. **5**
   (d) Differentiate Parallel and Perspective projection. **5**

2. (a) Discuss the segment table along with operations on segment. What are the other Displays file structures used ? **10**
   (b) Solve using Liang Barsky line clipping algorithm where $(x_{wmin}, x_{wmax}) = (1, 9)$ and $(y_{wmin}, y_{wmax}) = (2, 8)$ for line segments P1(3, 7) to P2(3, 10), P3(6, 6) to P4(8, 9) and P5(–1, 7) to P6(11, 1). **10**

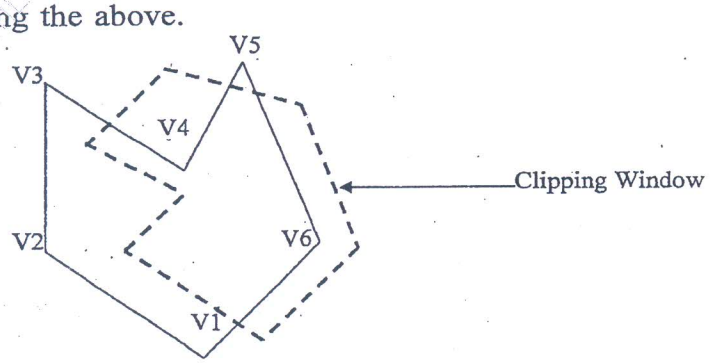
3. (a) Write short notes on :— **10**
   (i) Phong Shading (ii) Gouraud Shading
   (b) Explain mid point circle algorithm. In order to support your explanation, show Mathematical derivation. **10**

4. (a) Explain Warnock's algorithm used to remove Hidden surfaces with example. **10**
   (b) Explain Cohen Sutherland Line clipping algorithm. **10**

5. (a) Derive 2D transformation matrix, for performing rotation of given point P(x, y). By angle θ (theta) in anticlockwise direction about origin. Also explain the steps Required if rotation has to be carried out about Fixed Point(Xf, Yf). **10**
   (b) State mathematical equation for Bezier curve and Bezier surfaces. Explain Properties of Bezier curve. **10**

6. (a) Explain Sutherland Hodgeman polygon clipping algorithm with example. **10**
   (b) Explain Bit map character generation method. **5**
   (c) What do you understand by Diffuse Illumination and Point source Illumination ? **5**

7. (a) Explain how Weiler Atherton algorithm works for convex polygons ? Clip the polygon using the above. **10**



   (b) What is 3D clipping ? Derive equations for all the planes. **10**

Con. 12168-14.

S.E. (COMP), Sem. IV - (OLD) 04/06/2014

ADC.

(OLD COURSE) QP Code : **MV-18913**

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

N.B. : (1) Question No. **1** is compulsory.
(2) Attempt any **four** questions from the remaining **six** questions.
(3) Assume suitable data wherever required with justification.

1. (a) Define and explain various multiplexing techniques used in the communication systems. **10**

   (b) What is line coding? Draw the following waveforms for the sequence b (t) - 1101010 **10**
   - (i) UZR (unipolar RZ)
   - (ii) AMI
   - (iii) Manchester
   - (iv) NRZ-M
   - (v) Polar RZ

2. (a) An A.F. signal $20\sin(2\pi \times 500t)$ is used to amplitude modulate a carrier of $50 \sin(2\pi \times 10^5 t)$ calculate :- **10**
   - (i) Modulation index
   - (ii) Sidebeand frequencies
   - (iii) Amplitude of each sideband frequency
   - (iv) Bandwidth required

   (b) Compare Delta modulation, PCM and adaptive delta modulation. **10**

3. (a) Draw the block diagram of a super heterodybne radio receiver and explain the working with the help of waveforms. **10**

   (b) Explain the following : **10**
   - (i) Information
   - (ii) Information rate
   - (iii) Entropy
   - (iv) Channel capacity

   A messeage source generates four messages every microsecond. The probabilities of these messages are 0.4, 0.3, 0.2 and 0.1.
   Each message is independent of the other messages. Find the entropy and rate of information.

4. (a) Explain block diagram of BPSK transmitter and receiver and find Eucledian distance for BPSK. **10**

   (b) State the smpling theorem for low pass signals. Draw waveforms for all types of sampling techniques. Explain aliasing effect. **10**

5. (a) For a (7, 4) linear block code the generator matrix is given by, **10**

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

(i) Find all code vectors.
(ii) Find parity check matrix
(iii) Explain the process of error detection and correction.

(b) Classify and expalin in detail all types of noises that affect communication. **10**

6. (a) Explain Ratio detector with circuit diagram and explain why ratio detector is preferred over foster - seelay detector for FM modulation. **10**

(b) Explain BFSK transmitter and receiver. Draw PSD for BFSK and write the BW requirement. **10**

7. Write short notes on any **four** :- **20**
(a) Diode detector
(b) Pre-emphasis and De-emphasis
(c) Mathced Filter
(d) Need of modulation in communication
(e) PWM
