Total No. of Questions—12] [Total No. of Printed Pages—8

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S.E. (E & TC/Comp/I.T. (For Sem.-II)/Elect./Elect. SW/Instru. (For Sem.-I)) EXAMINATION, 2008

ENGINEERING MATHEMATICS—III

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) In Section I, attempt Q. No. **1** *or* Q. No. **2**, Q. No. **3** *or* Q. No. **4**, Q. No. **5** *or* Q. No. **6**.

In Section II, attempt Q. No. **7** *or* Q. No. **8**, Q. No. **9** *or* Q. No. **10**, Q. No. **11** *or* Q. No. **12**.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of non-programmable electronic pocket calculator is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Solve the following (any *three*) :

(*i*) $\left(D^2 + 9\right) y = \sec 3x$

(*ii*) $\left(D^5 - D\right) y = 4e^x + 2^{-x}$

(*iii*) $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = e^x \tan x$ [By variation of parameters]

(*iv*) $\left(x^3 D^3 + x^2 D^2 - 2\right) y = x + \frac{1}{x^2}$. [12]

P.T.O.

(*b*) Solve :

$$\frac{dx}{x(2y^4 - z^4)} = \frac{dy}{y(z^4 - 2x^4)} = \frac{dz}{z(x^4 - y^4)}.$$ [5]

Or

2. (*a*) Solve the following (any *three*) :

(*i*) $(D^2 + 5D + 6)\, y = e^{-2x} \sec^2 x\, (1 + 2 \tan x)$

(*ii*) $(D^5 - D^4 + 2D^3 - 2D^2 + D - 1)\, y = \sin x$

(*iii*) $x^3 \frac{d^2y}{dx^2} + 3x^2 \frac{dy}{dx} + xy = \cos(\log x)$

(*iv*) $(D^2 - 1)\, y = (1 + e^{-x})^{-2}$ [By variation of parameters]. [12]

(*b*) An e.m.f. E sin *pt* is applied at $t = 0$ to a circuit containing a condenser C and inductance L in series :

$$i = -\frac{dq}{dt}$$

and initially the current i and the charge q are zero. If

$$p^2 = \frac{1}{LC},$$

find the current in the circuit at time t. [5]

3. (*a*) If $f(z)$ is analytic, show that :

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^n = n^2\, |f(z)|^{n-2}\, |f'(z)|^2.$$ [5]

(*b*) If

$$f(z_0) = \oint_C \frac{3z^3 + 5z + 2}{z - z_0}\, dz$$

where 'C' is the ellipse :

$$\frac{x^2}{4} + \frac{y^2}{9} = 1,$$

find :

(*i*) $f(1)$,

(*ii*) $f''(1 - i)$. [6]

(*c*) Find the image of the triangular region bounded by $x = 0$, $y = 0$, $x + y = 1$ under the transformation $w = z^2$. [5]

Or

4. (*a*) Find the analytic function $f(z) = u + iv$ where :

$$u = \left(r + \frac{1}{r}\right)\cos\theta, \quad r \neq 0.$$ [5]

(*b*) Evaluate :

$$\oint_C \frac{e^z}{(z+1)^3 (z-1)^2}\, dz$$

where 'C' is the contour $|z + 1| = \frac{1}{2}$. [6]

(*c*) Show that the transformation :

$$w = z + \frac{1}{z} - 2i$$

maps the circle $|z| = 2$ into an ellipse. Find the centre of the ellipse and its semi major and minor axes. [5]

5. (*a*) Find z-transforms of the following :

(*i*) $Ka^{K-1}\ U(K-1),\ K \geq 0$

(*ii*) $\cos(7K+2)\ ,\ K \geq 0.$ [6]

(*b*) Solve the difference equation :

$$f(K+1)+\frac{1}{2}f(K)=\left(\frac{1}{2}\right)^{K},\ K \geq 0,\ f(0)=0.$$ [5]

(*c*) Find the Fourier transform of :

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

and hence evaluate :

$$\int_0^{\infty}\left(\frac{x\cos x-\sin x}{x^3}\right)\cos\frac{x}{2}\,dx.$$ [6]

Or

6. (*a*) Show that Fourier transform of :

$$f(x)=e^{-x^2/2}$$

is it self. [6]

(*b*) Find the inverse sine transform of :

$$F_s(\lambda)=\frac{1}{\lambda}e^{-a\lambda}.$$ [5]

(*c*) Find inverse z-transform of :

(*i*) $\dfrac{z^2}{z^2+1}$ (using inversion integral method)

(*ii*) $\dfrac{3z^2+2z}{z^2-3z+2},\ 1<|z|<2.$ [6]

SECTION II

7. (*a*) Find Laplace transform of (any *two*) :

(*i*) $\int_0^t te^{-4t} \sin 3t \, dt$

(*ii*) $t^2 v(t-1) - te^{-2t} \, \delta(t-2)$

(*iii*) $\frac{d}{dt}\left(\frac{\sin t}{t}\right)$. [8]

(*b*) Find inverse Laplace transform of $\frac{s}{(s^2 + a^2)^2}$. [4]

(*c*) Solve by Laplace transform method :

$$\frac{dy}{dt} + 3y(t) + 2\int_0^t y(t)\, dt = t, \text{ given } y(0) = 0.$$ [4]

Or

8. (*a*) Find inverse Laplace transform of (any *two*) :

(*i*) $\frac{e^{-3s}}{s^2 + 8s + 25}$

(*ii*) $\frac{s+1}{(s^2 + 2s + 2)^2}$

(*iii*) $\log\left(1 + \frac{a^2}{s^2}\right)$. [8]

(*b*) Find Laplace transform of :

$$f(t) = \begin{cases} t & , \quad 0 < t < \pi \\ \pi - t & , \quad \pi < t < 2\pi \end{cases} \text{ and } f(t + 2\pi) = f(t). \qquad [4]$$

(*c*) Express the following function in terms of Heavisides unit step function and hence find the Laplace transform :

$$f(t) = \begin{cases} \cos t & , \quad 0 < t < \pi \\ \sin t & , \quad t > \pi \end{cases}. \qquad [4]$$

9. (*a*) Prove the following (any *two*) :

(*i*) $\nabla \cdot \left[r \nabla \left(\frac{1}{r^3} \right) \right] = \frac{3}{r^4}$

(*ii*) $\bar{a} \cdot \nabla \left[\bar{b} \cdot \nabla \left(\frac{1}{r} \right) \right] = \frac{3(\bar{a} \cdot \bar{r})(\bar{b} \cdot \bar{r})}{r^5} - \frac{(\bar{a} \cdot \bar{b})}{r^3}$

(*iii*) $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$. [8]

(*b*) Find the constants m, n such that the surface $mx^2 - 2nyz = (m + 4)x$ will be orthogonal to the surface $4x^2y + z^3 = 4$ at the point $(1, -1, 2)$. [5]

(*c*) Find the function $f(r)$ so that $f(r)\,\bar{r}$ is solenoidal. [4]

Or

10. (*a*) Show that :

$$\bar{F} = \left(ye^{xy} \cos z\right) \bar{i} + \left(xe^{xy} \cos z\right) \bar{j} - e^{xy} \sin z \bar{k}$$

is irrotational. Find ϕ if $\bar{F} = \nabla\phi$. [6]

(*b*) Find the directional derivative of :

$$\phi = 4xz^3 - 3x^2y^2z$$

at (2, –1, 2) along a line equally inclined with co-ordinate axes. [6]

(*c*) If $\rho\overline{E} = \nabla\phi$, prove that $\overline{E} \cdot \text{curl}\,\overline{E} = 0$. [5]

11. (*a*) Find the work done in moving the particle once round the ellipse :

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1,\ z = 0,$$

if field of force is :

$$\overline{F} = \left(2xy + 3z^2\right)\bar{i} + \left(x^3 + 4yz\right)\bar{j} + \left(2y^2 + 6xz\right)\bar{k}\,.$$ [6]

(*b*) Evaluate :

$$\iint_S \left(x^3\bar{i} + y^3\bar{j} + z^3\bar{k}\right) \cdot d\overline{S}$$

where S is the surface of the sphere $x^2 + y^2 + z^2 = 16$. [5]

(*c*) Evaluate :

$$\iint (\nabla \times \overline{F}) \cdot d\overline{S},$$

where :

$$\overline{F} = \left(x^3 - y^3\right)\bar{i} - xyz\,\bar{j} + y^3\,\bar{k}$$

and S is the surface $x^2 + 4y^2 + z^2 - 2x = 4$ above the plane $x = 0$. [6]

Or

12. (*a*) Evaluate :

$$\int_C \overline{F} \cdot d\overline{r} \text{ for } \overline{F} = 3x^2 \bar{i} + (2xz - y)\bar{j} + z\overline{k}$$

along the straight line joining (0, 0, 0) to (1, 2, 3). [6]

(*b*) Prove that :

$$\iint_S \frac{\bar{r}}{r^3} \cdot \hat{n}\, dS = 0. \quad [5]$$

(*c*) Maxwell's equations are given by :

$$\nabla \cdot \overline{E} = 0, \nabla \cdot \overline{H} = 0, \nabla \times \overline{E} = -\frac{\partial \overline{H}}{\partial t}, \nabla \times \overline{H} = \frac{\partial \overline{E}}{\partial t},$$

show that $\overline{E}$ and $\overline{H}$ satisfy :

$$\nabla^2 u = \frac{\partial^2 u}{\partial t^2}. \quad [6]$$

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S.E. (Information Technology) EXAMINATION, 2008

MANAGEMENT AND FINANCE

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :—(*i*) Answer any *three* questions from each Section.

(*ii*) Answer *three* questions from Section I and *three* questions from Section II.

(*iii*) Answers to the two Sections should be written in separate answer-books.

(*iv*) Neat diagrams must be drawn wherever necessary.

(*v*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Explain the contributions made by the following thinkers to the development of management in brief : [8]

(1) H. L. Grantt

(2) H.B. Gilbreth.

(*b*) State and explain the various managerial styles. [8]

Or

(*a*) Distinguish between Management and Administration. [8]

(*b*) Explain management as an art and science. [8]

2. (*a*) Define the Law of Demand and Law of Supply. What are the exceptions to law of demand ? Explain. [8]

P.T.O.

(*b*) Define the following :

(1) Price

(2) Value

(3) Economic goods

(4) Utility. [8]

Or

Explain the following : [16]

(1) E-Business

(2) ERP

(3) Intellectual property laws

(4) Types of contracts.

3. (*a*) Explain the following organizational structure with sketches : [10]

(1) Line structure

(2) Project structure

(*b*) Explain the partnership in detail as a form of business. [8]

Or

(*a*) Explain the formation of Joint Stock Companies in detail with merits and demerits. [12]

(*b*) Explain the functions of an organization. [6]

SECTION II

4. (*a*) Explain McGregor's theory X and theory Y in brief. [8]

(*b*) Explain the different methods of training. [8]

Or

(*a*) Define Communication. Explain the barriers to effective communication. [8]

(*b*) Explain the process of Manpower planning. [8]

5. (*a*) What is Budgetary Control ? What are its advantages ? Explain. [8]

(*b*) Explain functions of capital market in India. [8]

Or

Explain the following in brief : [16]

(1) Balance sheet and its contents

(2) Sources of capital.

6. (*a*) Explain the following ratios and their significance : [8]

(1) Activity ratio

(2) Liquidity ratio

(*b*) Explain the following : [10]

(1) Letter of credit

(2) Payback method.

Or

(*a*) What is Depreciation ? Explain any *two* methods of calculating depreciation. [6]

(*b*) Explain the process of credit rating of IT companies. [6]

(*c*) Explain the importance of ratio analysis. [6]

Total No. of Questions—12] [Total No. of Printed Pages—4

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S.E. (IT) EXAMINATION, 2008

MICROPROCESSOR SYSTEM

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer *three* questions from Section I and *three* questions from Section II.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Draw and explain the architecture of 8086 highlighting the improvements over 8085. [10]

(*b*) Draw Read cycle timing diagram for minimum mode operation of 8086 showing necessary signals. [6]

Or

2. (*a*) Draw and explain in brief minimum mode 8086 system. [10]

(*b*) Draw Write cycle timing diagram for minimum mode of operation of 8086 showing necessary signals. [6]

P.T.O.

3. (*a*) Explain the following instructions with an example :

(*i*) XCHG

(*ii*) TEST

(*iii*) LOOP

(*iv*) ROR. [8]

(*b*) What are the components of MS-DOS ? How is MS-DOS loaded ? [8]

Or

4. (*a*) Differentiate between .exe and .com. [4]

(*b*) Differentiate between far and near procedures. [4]

(*c*) Explain the functions of the following signals of 8086 :

(*i*) Ready

(*ii*) MN / $\overline{MX}$

(*iii*) $\overline{BHE}$ / S_7

(*iv*) $\overline{TEST}$. [8]

5. (*a*) Draw and explain block diagram of 8259 (Interrupt Controller). [10]

(*b*) Write ALP for 8086 to generate a square wave of 1 ms using 8253/54 running at 1.5 MHz. (Assume suitable address) [8]

Or

6. (*a*) Draw and explain block diagram of 8254 timer. [8]

(*b*) What are different types of interrupts in 8086 ? How 8086 will respond when it receives interrupt signal on 'INTR' pin ? [10]

SECTION II

7. (*a*) Explain mode 1 of 8255 when Port A (P_A) is configured in Input mode. (Draw timing diagram) [8]

(*b*) Draw and explain internal block diagram of 8237. [8]

Or

8. (*a*) What is the difference between synchronous and asynchronous communication ? [6]

(*b*) A 8251 USART is to be initialized as follows :

(*i*) Baud rate factor X64

(*ii*) 8-bits/character

(*iii*) Even Parity

(*iv*) One stop bit

(*v*) Transmitter enabled

(*vi*) DTR and RTS asserted

(*vii*) Error flag set

(*viii*) No hunt mode, No break character.

Find Mode word and Command word. Write sequence of instructions to initialize 8251. [10]

9. Explain in detail address translation from logical to physical address in Real mode as well as protected mode of 80386. [16]

Or

10. (*a*) What do you understand by descriptor table ? Which are different types of descriptor tables in 80386 ? Explain. [8]

(*b*) What is call gate ? Explain how it is used in calling a function with higher privilege level. [8]

11. (*a*) What is the difference between IVT of Real mode and IDT of protected mode of 80386 ? [6]

(*b*) How to switch from Real mode to VM-86 mode of 80386 ? [2]

(*c*) What is Nested task ? Explain. Explain significance of Backlink Field. [10]

Or

12. (*a*) Write short notes on :

(*i*) Task State Segment (TSS)

(*ii*) VM86 mode of 80386

(*iii*) Pentium Architecture. [16]

(*b*) Give significance of Busy bit. [2]

Total No. of Questions—12] [Total No. of Printed Pages—4+2

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S.E. (IT) (Second Semester) EXAMINATION, 2008

DATA STRUCTURES AND FILES

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answers to the two Sections should be written in separate answer-books.

(*ii*) Neat diagrams must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

SECTION I

1. (*a*) Determine the frequency count for each statement in the following piece of code. Obtain its time complexity in terms of '*n*' :

```
for (i = 1; i < = n; i++)
    for (j = 1; j < = i; j++)
        for (k = 1; k < = j; k++)
            x = x + 1;
```

[6]

(*b*) Write pseudo 'C' code for Sparse Matrix Addition. [6]

(*c*) Explain the different notations used to represent time complexity. [6]

Or

2. (*a*) Write pseudocode in 'C' or algorithms for simple transpose and fast transpose and compare their complexities. [6]

P.T.O.

(*b*) Find out frequency count for each step in the following piece of code :

```
x = 5; y = 5;
for (i = 2; i < = x; i++)
   for (j = y; j > = 0; j--)
      {
         if (i = = j)
            printf ("xxx");
         else
            break;
      }
```

[6]

(*c*) Compare linear search and binary search w.r.t. their time and space complexities. [6]

3. (*a*) Write an algorithm to accept a prefix expression and construct its binary tree and perform recursive and non-recursive in-order traversal of the tree. [10]

(*b*) Suppose the following sequences list the nodes of a binary tree T in pre-order and in-order, respectively.

Pre-order : G, B, Q, A, C, K, F, P, D, E, R, H

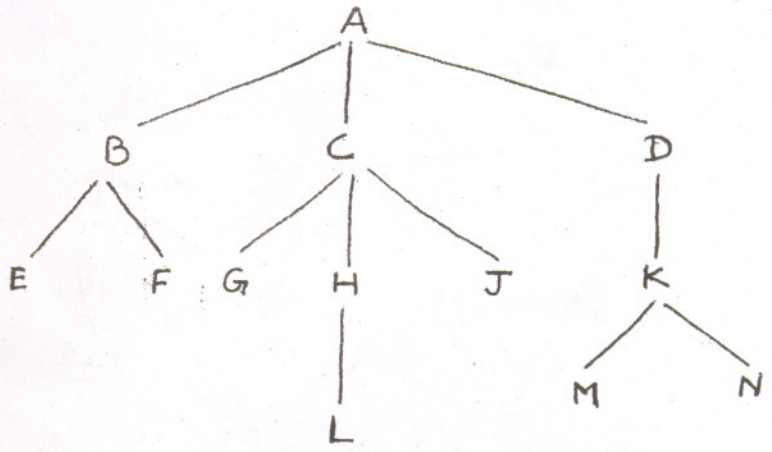
In-order : Q, B, K, C, F, A, G, P, E, D, H, R.

Draw the tree. [6]

Or

4. (*a*) Write a note on red and black tress. [4]

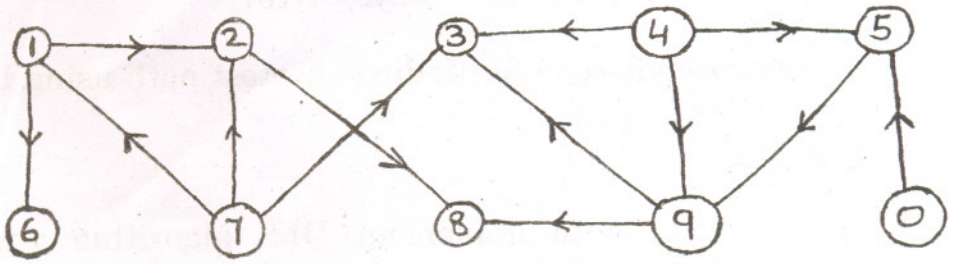
(*b*) What is the necessity of converting a tree into binary tree ? Given the following tree :



Convert it into a binary tree and list down the steps for the same. [6]

(*c*) Write an algorithm to delete a node from a binary search tree. [6]

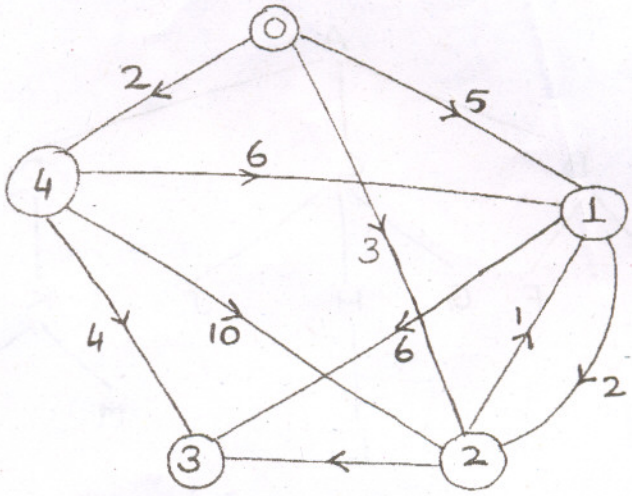
5. (*a*) For the given graph :



(*i*) Generate adjacency list

(*ii*) Generate adjacency matrix. [4]

(*b*) Write pseudo-code to implement BFS algorithm and obtain a minimum spanning tree from vertex 0 for the given graph, using adjacency list. [6]



(*c*) Write pseudocode to implement Kruskal's algorithm. [6]

Or

6. (*a*) Represent the following polynomial using GLL :

$$8x^3y^2z - 5x^2y^3z^2 + 7xyz^3 + 10.$$ [6]

(*b*) Implement pseudo-code for finding shortest path using Djikstra's algorithm. [4]

(*c*) Write pseudo-code to implement DFS algorithm and obtain a minimum spanning tree from vertex 0 for the graph given in Q. No. 5 (*b*), using adjacency matrix. [6]

SECTION II

7. (*a*) Why is the Dijkstra's algorithm for finding shortest path called greedy ? Give example. [2]

(*b*) Sort the following nos. using heapsort :

44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66.

Create the heap first and then sort it. Show each step separately. [16]

Or

8. (*a*) Define symbol table with an example. [2]

(*b*) For the following sequence, insert the values, in the order shown, to build them into an AVL tree. Show the balance factor and rotations of each node inserted at each step :

A, Z, B, Y, C, X, D, W, E, V, F. [16]

9. (*a*) Write notes on :

(*i*) Divide and conquer algorithms

(*ii*) Greedy algorithms. [8]

(*b*) Write pseudo-code in 'C' for quick sort and merge sort. Compare the two w.r.t. algorithm strategies used, time and space complexities. [8]

Or

10. (*a*) Write notes on :

(*i*) Backtracking algorithm

(*ii*) Dynamic programming. [8]

(*b*) Solve the general Knapsack problem using greedy method. [8]

11. (*a*) For the given set of values,

10, 100, 32, 45, 58, 126, 3, 29, 200, 400, 0.

Create a hash table and resolve collisions, if any, using linear probing with and without replacements. [8]

(*b*) Write notes on sequential and direct file organizations. [8]

Or

12. (*a*) Write a note on re-hashing. [4]

(*b*) For the given set of values,

9, 45, 13, 59, 12, 75, 88, 11, 105, 46.

Create a hash table and resolve collisions using chaining with and without replacement. [8]

(*c*) Write pseudo-code for implementation of simple index file. [4]

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S.E. (I.T.) EXAMINATION, 2008

PRINCIPLES OF COMMUNICATION ENGINEERING

(2003 COURSE)

Time : Three Hours **Maximum Marks : 100**

N.B. :— (*i*) Answer any *three* questions from each Section.

(*ii*) Answers to the two Sections should be written in separate answer-books.

(*iii*) Neat diagrams must be drawn wherever necessary.

(*iv*) Figures to the right indicate full marks.

(*v*) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

(*vi*) Assume suitable data, if necessary.

SECTION I

1. (*a*) Show the different frequency bands in an electromagnetic spectrum. Also state the applications of each of the frequency bands shown in the spectrum. [8]

(*b*) State the difference between Fourier series and Fourier transform with appropriate examples. [8]

P.T.O.

Or

2. (*a*) Draw and explain the block diagram of communication system, stating the different types of electronic communications. [8]

(*b*) Find and sketch the Fourier series corresponding to a square wave of 1 kHz and peak voltage 1 V. [8]

3. (*a*) Define amplitude modulation. Express it with its mathematical equation. Sketch the AM waveform in time domain and frequency domain. [8]

(*b*) State any *eight* differences between AM and FM. [8]

Or

4. (*a*) Audio frequency signal of $20 \sin 2\pi \times 1000t$ is used to amplitude modulate a carrier of $100 \sin 2\pi \times 10^5 t$. Calculate modulation index, sideband frequencies, amplitude of each sideband and B.W. required. [8]

(*b*) An FM broadcast transmitter operates at its maximum deviation of 75 kHz. Find the modulation index for a sinusoidal modulating signal with a frequency of 50 Hz and 15 kHz. [8]

5. (*a*) Draw and explain the block diagram of SSB transmitter using third method. [8]

(*b*) Draw a neat block diagram of FM receiver and explain each block in detail. [10]

Or

6. (*a*) Draw and explain the block diagram of FM transmitter using Armstrong's method. [8]

(*b*) Draw a neat block diagram of superhetrodyne MW and SW receiver and explain it in detail. [10]

SECTION II

7. (*a*) What is Multiplexing ? Explain the FDM in detail with a neat block diagram. [8]

(*b*) What is a facsimile system ? Draw and explain with a block diagram. [8]

Or

8. (*a*) Compare FDM and TDM system. [8]

(*b*) What is paging system ? Explain it with a neat block diagram. [8]

9. (*a*) Compare ground, sky and space wave propagation. [8]

(*b*) Draw and explain the block diagram of TV receiver. [10]

Or

10. (*a*) Explain the following terms with respect to antennas : [8]

(*i*) Directive gain

(*ii*) Efficiency

(*iii*) Beamwidth

(*iv*) Bandwidth.

(*b*) Draw and explain the block diagram of satellite TV receiver. [10]

11. (*a*) Explain the different modulation techniques used in modems. [8]

(*b*) Explain the ISO-OSI reference model used for computer networks. [8]

Or

12. (*a*) Compare FHSS and DSSS techniques. [8]

(*b*) Draw and explain a general block diagram for fiber optic communication stating its advantages. [8]