

**DRAFT Diploma in Telecommunication from Karnataka State, Directorate of Technical exam(old annual scheme)**

**Diploma – I year: To get from Directorate of Tech exam board website or elsewhere**

**Practicals ( Done) + Total marks as per Marks sheet**

**Diploma – I year**

**ENGLISH:**

## **ENGLISH COMMUNICATION**

**Contact Hrs./Week: 4**

**Contact Hrs. / Semester: 64**

**GOAL: IMPROVEMENT OF ENGLISH COMMUNICATION SKILLS OF I OR II SEMESTER  
STUDENTS OF DIPLOMA COURSES IN ENGINEERING AND TECHNOLOGY.**

### **SPECIFIC INSTRUCTIONAL OBJECTIVES:**

#### **1 READING SKILL**

The student is able to :

- 1.1 Understand the difficult words and phrases in the lesson
- 1.2 Use the words and phrases correctly in his own sentences
- 1.3 Read the lesson properly without mistakes
- 1.4 Read the given passage correctly.

#### **2 WRITING SKILL**

The student is able to

- 2.1 Write the answers correctly to the questions on the lessons
- 2.2 Write personal letters in the proper format without mistakes
- 2.3 Use words and phrases in his own sentences
- 2.4 write grammatically correct sentences.

### **3 PRACTICAL KNOWLEDGE OF GRAMMAR**

The student is able to

- 3.1 Use verbs correctly
- 3.2 Use various phrases appropriately
- 3.3 Use interrogatives and negatives
- 3.4 Convert active voice into passive and vice versa
- 3.5 Frame questions, question tags and give short form answers correctly
- 3.6 Use prepositions appropriately

### **4 COMPREHENSION**

- 4.1 The student is able to read and understand the seen & unseen passages and answer the questions given

### **5 CREATING AWARENESS**

- 5.1 The student becomes aware of current environmental issues and about his responsibilities toward environment factors.
- 5.2 Awareness about Right to Information Act

## **CONTENT**

- 1 **TEXT BOOK** **“ENGLISH COMMUNICATION FOR POLYTECHNICS” By NITTTR, Chennai and Published by Orient BlackSwan Pvt Ltd, Hyderabad.**

### **2 GRAMMAR**

- 2.1 PARTS OF SPEECH
- 2.2 COUNTABLE, UNCOUNTABLE AND PROPER; NOUNS
- 2.3 USE OF SOME, ANY, MUCH, MANY, A LOT OF, ETC.,
- 2.4 MAIN AND AUXILIARY VERBS

- 2.5 USES OF TENSES
- 2.6 ACTIVE AND PASSIVE VOICE
- 2.7 INTEROGATIVES
- 2.8 NEGATIVES
- 2.9 PREPOSITIONS
- 3.1 QUESTION TAGS
- 3.2 USE OF ADVERB TOO
- 3.3 USING PHRASES IN OWN SENTENCES

### **3 COMPOSITION & COMPREHENSION**

- 3.1 WRITING RESPONSE TO PICTURE
- 3.2 STORY FROM GIVEN OUTLINES
- 3.3 EXPANDING OUTLINES INTO PARAGRAPH
- 3.4 PARAGRAPH WRITING USING HINTS
- 3.5 COMPREHENSION OF UNSEEN PASSAGE
- 3.6 NOTE MAKING
- 3.7 DEVELOPING NOTES INTO PARAGRAPHS
- 3.8 SUMMERISING

MONTHLY TESTS

READING AND COMPREHENSION EVALUATION

## **ENGINEERING MATHEMATICS**

### **CONTENTS OF APPLIED MATHEMATICS – I**

#### **ALGEBRA**

**UNIT – 1: DETERMINANTS.**

**2 Hr.**

Definition, Order, Expansion of  $2^{\text{nd}}$  &  $3^{\text{rd}}$  order Determinants by means of examples. Problems on finding unknown quantity in a  $2^{\text{nd}}$  &  $3^{\text{rd}}$  determinant using expansion. Solving simultaneous linear equations by determinant method (Cramer's rule). Problems.

#### **UNIT – 2: MATRICES.**

**4 Hr.**

Determinant value of a square matrix. Singular and non singular matrices with examples. Minor and co factor of an element of a matrix. Adjoint of a matrix. Problems. Characteristics equations of a square matrix and its roots. Problems. Cayley – Hamilton's theorem (statement only). Problems. Find inverse of a matrix using the theorem.

#### **UNIT – 3: BINOMIAL THEOREM.**

**3 Hr.**

Meaning of  ${}^n\text{Cr}$  and its value. Binomial theorem for  $(x + a)^n$ , where  $n$  is a positive integer. Expansion. Finding constant term, co-efficient of  $x^n$ , particular term and middle term(s). Problems.

#### **UNIT – 4: LOGARITHMS.**

**2 Hr.**

Definition of common and natural logarithms. Laws of logarithms. Problems on laws.

#### **UNIT – 5: VECTOR ALGEBRA.**

**6 Hr.**

Definition of vector. Representation of a vector as a directed line segment. Magnitude of a vector. Types of vectors. Position vector. Vector can be expressed in terms of end points of position vector. Addition and subtraction of vector in terms of line segment. Vector in a plane and vector in a space in terms of unit vector  $i$ ,  $j$  and  $k$  respectively. Product of vectors. Scalar and vector product. Geometrical meaning of scalar and vector product. Applications of dot(scalar) and cross(vector) product: Projection of a vector on another vector. Area of parallelogram and area of triangle. Work done by a force and moment of force

# TRIGONOMETRY

## UNIT – 6: UNITS AND MEASUREMENT OF AN ANGLE

3 Hr

Defination of an angle. Systems of unit of an angle. Defination of radian. Radian is a constant angle. Relation between degree & radian and problems. Derivation of  $l = r\theta$  &  $A = \frac{1}{2} r^2\theta$ . Problems.

## UNIT –7: TRIGONOMETRIC RATIOS OF AN ACUTE ANGLE.

6 Hr

Defination of Trigonometric ratios in terms of sides of a triangle for an acute angle. Proof of Trigonometric identities. Trigonometric ratios of standard angles: The numerical value of trigonometric ratios of standard angles like  $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$  and  $90^\circ$ . Problems.

## UNIT – 8: ALLIED ANGLES.

4 Hr.

Angle of any magnitude, sign of the trigonometric ratios. Meaning of allied angles. Trigonometric ratios of allied angles in terms of  $\theta$ . Problems. Complimentary angles and relation between trigonometric ratios of complimentary angles. Problems.

## UNIT – 9: HEIGHTS AND DISTANCES.

2 Hr.

Defination of angle of elevation and depression. Problems.

## UNIT -10: COMPOUND ANGLES.

3 Hr.

Geometrical proof of  $\sin(A + B)$  and  $\cos(A + B)$ . Find  $\tan(A + B)$  using  $\sin(A + B)$  and  $\cos(A + B)$ . Write the formulae for  $\sin(A - B)$ ,  $\cos(A - B)$  and  $\tan(A - B)$ . Problems.

## UNIT -11: MULTIPLE ANGLES.

3 Hr.

Derive ratios of multiple angles of  $2A$  and  $3A$ . Problems. Obtain sub multiple angle formulae. Problems.

#### **UNIT-12: TRANSFORMATION FORMULAE.**

**4 Hr.**

Express sum or difference of Sine and Cosine of an angles in to product form. Express product of Sine and Cosine of angles in to sum or difference form. Problems.

#### **UNIT-13: PROPERTIES AND SOLUTION OF TRIANGLES.**

**4 Hr.**

The relation between sides of a triangle and Sines, Cosines and Tangents of any angle (Sine rule, Cosine rule and Tangent rule), Projection rule. Half angle formulae in terms of sides of a triangle. Problems. Problems on solution of triangles (four types).

#### **UNIT- 14: INVERSE TRIGONOMETRIC FUNCTIONS.**

**2 Hr.**

Defination. Principle values of inverse trigonometric functions. Derivation of results like  $\sin^{-1}x + \cos^{-1}x = \pi/2$ ,  $\tan^{-1}x + \cot^{-1}x = \text{cosec}^{-1}x + \sec^{-1}x$ ,  $\tan^{-1}x + \tan^{-1}y = \tan^{-1}$

Problems.

## **ANALYTICAL GEOMETRY**

#### **UNIT-15: BASIC CONCEPTS OF ANALYTICAL GEOMETRY.**

**6 Hr.**

Defination of a point in a plane, Specification of a point using co-ordinate system. Points on X-axis and Y-axis. Derivation of distance formula. Problems. Section formulae. Derivation of co-ordinate of a point which divide the line internally in the given ratio( No derivation for external division). Mid point formula. Problems. Centroid, area of a triangle and collinear points. Problems.

Locus of a point with respect to a fixed point and with respect to two fixed points and its equations. Problems.

## UNIT-16: STRAIGHT LINES.

6 Hr.

Inclination of a line with horizontal line and its slope. Intercept of a straight line. Slope of a line parallel to X-axis and Y-axis. Derivation of conditions for two lines to be parallel and perpendicular. Problems. Derivations equations of straight lines  $y = mx + c$ ,  $y - y_1 = m(x - x_1)$ ,  $y - y_1 = (y_2 - y_1 / x_2 - x_1)(x - x_1)$ ,  $(x/a) + (y/b) = 1$  and  $x \cos \alpha + y \sin \alpha = P$ . General equation of a line  $ax + by + c = 0$  and problems. Equation of lines through a point and parallel or perpendicular to a given line. Problems. Angle between two lines. Problems. Point of intersection of lines. Equation of a line through the point of intersection which is parallel or perpendicular to the given line. Problems.

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## ENGINEERING SCIENCE

### SCIENCE (SOUND AND OPTICS)

### ELEMENTS OF MECHANICAL ENGINEERING

### ELEMENTS OF ELECTRICAL ENGINEERING

- 1 BASICS OF ELECTRICITY**
  - 1.1 Definition of Electric Current, EMF, Electric Potential potential difference, Resistance
  - 1.2 State Ohm's law, Specific Resistance, Simple problems
  - 1.3 limitations of Ohm's law,
  - 1.4 Analyse Series and Parallel Combination of Resistance simple problems
  - 1.5 State Kirchoff's Current and Voltage law with simple problems
  - 1.6 Discuss Power, Energy and units (simple problems to be solved on related topics)
- 2 ELECTROSTATICS**
  - 2.1 Definition of Electric charge, Electric field, Electric Flux Flux Density, Field Strength, Dielectric, Dielectric constant Dielectric Strength, Absolute permittivity, Relative permittivity
  - 2.2 Coulomb's laws, Illustrate with simple problems
  - 2.3 Definition of Capacitor, Capacitance, factors on which capacitance of capacitor depends
  - 2.4 Analyse Series and parallel combination of capacitors, with simple problems
  - 2.5 Explain charging and discharging of capacitor and time constant
- 3 ELECTROMAGNETIC INDUCTION**
  - 3.1 State Faraday's Laws and Lenz's laws

- 3.2 Definition of Flux, MMF, Reluctance, absolute permeability, relative permeability, Self Inductance, Mutual Inductance
- 3.3 Expression for Energy stored in a Inductor
- 3.4 Analyse Inductance in Series and parallel, Co-efficient of coupling, simple problems
- 3.5 Discuss Inductive reactance and Definition of Quality Factor
- 4 **AC FUNDAMENTALS**
  - 4.1 Define Amplitude Peak value, Cycle, Frequency, Time Period Phase with respect to Sine Wave
  - 4.2 Discuss Phase difference, Leading and Lagging Phase shifts
  - 4.3 Expression for RMS value, Average Value
  - 4.4 Discuss Form factor, Peak factor, Simple problems
- 5 **AC CIRCUITS**
  - 5.1 Analyse current & Voltage in a pure R, L and C circuit with phasor diagram
  - 5.2 Analyse of AC through R-L, R-C and R-L-C circuits in terms of Impedance, phase and power factor. simple problems  
Principle of 3-Phase system & Discuss- Star and Delta connection
  - 5.4 and relation ( no derivation )
- 6 **TRANSFORMERS**
  - 6.1 Study of principle of operation of Transformer
  - 6.2 EMF equation, turns ratio, Voltage transformation ratio, losses, Efficiency, Regulation simple problems
  - 6.3 Construction of Power transformer
  - 6.4 Classification of transformer based on core, frequency.
  - 6.5 Auto transformer - Principle & applications
  - 6.6 uses of isolation transformer, RFT, AFT and pulse transformer
- 7 **BATTERIES, RELAYS AND MOTORS**
  - 7.1 Definition of Cell, primary and Secondary cell with suitable example and their comparison
  - 7.2 Construction of Lead Acid Battery
  - 7.3 Analyse series and parallel combination of cells
  - 7.4 Discuss precautions to be taken in battery maintenance
  - 7.5 Discuss various types of batteries used in UPS and Electronic equipments
  - 7.6 Working principle of Electromagnetic relay. Classification of relays based on the principle of operation, polarization and applications.  
List the Contact materials used in relays & list their characteristics.
  - 7.8 Principle of operation of DC Motors, Stepper Motors and DC Generators.
  - 7.9 and their applications
- 8 **PASSIVE COMPONENTS**
  - 8.1.0 **RESISTORS**
    - 8.1.1 Specification of resistors-- ohmic value, Tolerance, Power rating and Thermal Stability
    - 8.1.2 Constructional features of carbon composition, Metal film and



- wire wound fixed Resistors.
- applications of Resistors
- Constructional features of Carbon composition -linear and logarithmic and wire wound potentiometers
- 8.1.3 principle of operation of LDR, VDR and Thermister .
- Applications of fixed Resistors, POTs , Rheostats , LDR, VDR and Thermisters
- 8.1.5 Identify the Resistance value by color code and letter code (BS 1852) method
- 8.1.6
- 8.2.0 CAPACITORS
- 8.2.1 Specifications of Capacitor
- 8.2.2 Classification of Capacitors based on Dielectric materials
- constructional features of Fixed ( Ceramic,electrolytic,tantalum ) and variable (Gang) Capacitors.
- 8.2.3 Identify the capacitance value by color code & letter code
- 8.2.4 method.
- 8.2.5 Applications of capacitors.
- 8.3.0 INDUCTORS
- 8.3.1 Specifications,
- 8.3.2 Classification based on core and frequency.
- 8.3.3 Identify the Inductance value by color code.
- 8.3.4 Applications of Inductors.

## ELECTRONICS ENGINEERING –I

### **1 NUMBER SYSTEMS AND CODES**

- 1.1 List different number systems & their relevance: binary, octal, decimal, hexadecimal
- 1.2 Study the Conversion from one number system to another
- 1.3 Perform Arithmetic operations on all number systems
- 1.4 Represent the Concept of complementay numbers: 1's & 2's complementary of binary numbers
- 1.5 Perform Subtraction of binary numbers using complementary numbers
- 1.6 Study Codes: definition,relevance,types (BCD, Gray, Excess-3, ASCII & EBCDIC) and applications
- 1.7 Examples for the above

### **2 LOGIC GATES**

- 2.1 Illustrate the Difference between analog signals & systems and digital signals & systems
- 2.2 Discuss the Types of logics & representation using electric signals
- 2.3 Know the Definition of gate
- 2.4 Learn the Basic Logic Gates (NOT, OR, AND, NOR, NAND, EX-OR & EX-NOR) - symbol,function, expression, truth table .

- 2.5 Define Universal Gates with examples & realisation of other gates

### **3 BOOLEAN ALGEBRA**

- 3.1 Understand Boolean: constants, variables & functions
- 3.2 Comprehend the Laws & Identities of Boolean algebra
- 3.3 State and prove Demorgan's Theorems
- 3.4 Represent Logic Expression: SOP & POS forms & conversion
- 3.5 Simplify the Logic Expressions / Functions (Maximum of 4 variables) : using Boolean algebra and Karnaugh's map methods
- 3.6 Realisation of simplified logic expressions using gates

### **4 COMBINATIONAL CIRCUITS**

- 4.1 Define a Combinational Circuit and explain with examples
- 4.2 Arithmetic Circuits (Binary)
  - a) Realise function, Logical expression, gate Level logic circuit , truth table & applications of half-adder, half-subtractor, full-adder & full-subtractor
  - b) Explain Serial & Parallel adders: concept, comparison & applications.
  - c) Working of 2 & 4 bit parallel adders with logic circuit .
  - d) Construct 2 bit Magnitude Comparator: logic expression, truth table, gate level circuit .
- 4.3 Discuss Encoders: definition, relevance, gate level circuit of decimal to BCD Encoders, Truth table, Definition of Priority Encoder.
- 4.4 Discuss Decoders: definition, relevance, gate level circuit of BCD to Decimal Decoders, BCD to Seven Segment Decoder with truth tables.
- 4.5 Explain the working of Binary-Decimal: Encoder & Decoder
- 4.6 Discuss Multiplexers: definition, relevance, gate level circuit and Truth Tables of 2:1, 4:1, 8:1. Multiplexers.
- 4.7 Realisation of high order multiplexers using simple multiplexers
- 4.8 Discuss Demultiplexers: Definition, relevance, gate level circuit and truth tables of 1:2, 1:4 , 1:8 Demultiplexers .

### **5 SEQUENTIAL LOGIC CIRCUITS**

- 5.1 **Flip-Flops**
  - 5.1.1 Define Sequential Circuit: Explain with examples
  - 5.1.2 Compare Combinational and Sequential Logic Circuits
  - 5.1.3 Clock-definition, characteristics, types of triggering & waveform.
  - 5.1.4 Define Flip-flop
  - 5.1.5 Study RS, clocked RS, D, T, JK FF -Race around condition, MS-JK flip-flops with gatelevel circuit using NAND gates only, logic circuit and truth table.
  - 5.1.6 Applications of flip-flops.

## **5.2 SHIFT REGISTERS**

- 5.2.1 Introduction to Registers.
- 5.2.2 Explain the working of various types of shift registers - SISO, SIPO, PISO, PIPO with truth table using flip flop
- 5.2.3 Working of 4 Bit Ring and Johnson Counters with timing diagram and Truth table.
- 5.2.4 Applications of shift registers

## **5.3 COUNTERS**

- 5.3.1 Define Synchronous and Asynchronous Counters - Their Comparison.
- 5.3.2 Explain the modulus of a counter
- 5.3.3 Design of different Modulo counters using decoding gates.
- 5.3.4 Explain the working of 4 bit ripple counter with truth table and timing diagram
- 5.3.5 Define the propagation delay in ripple counter
- 5.3.6 Explain the Four Bit Synchronous counter with truth table and timing diagram
- 5.3.7 List out applications of counters

## **6 LOGIC FAMILIES**

- 6.1 Introduction, list of various logic families & standard notations
- 6.2 Explain propagation delay, fan-out, fan-in, power dissipation, Noise Margin, Noise Immunity & speed with reference to logic families.
- 6.3 List and Compare the Features of Standard TTL, CMOS & ECL- Concept of Saturated and Non Saturated Logic.
- 6.4 Describe the Interfacing between TTL & CMOS

ENGINEERING DRAWING –I

SCIENCE PRACTICALS

SCIENCE PRACTICALS (SOUND AND OPTICS)

WORKSHOP (CARPENTRY AND FITTERS) PRACTICE

ELECTRONICS LABORATORY

Diploma – II year

ENGINEERING MECHANICS

**Simple Stress and Strains**

Compressive, Tensile, shearing stresses, Hooke's law, Stress strain diagram, Ultimate strength, working stress, Factor of safety and elastic constants, Poisson's ratio, relation between the elastic constants, bars of varying section, composite bars, temperature stresses, strain energy, impact loads, properties of metals- electricity plasticity, malleability, brittleness, hardness, ductility, tenacity, fatigue of metals

### **Geometric properties of sections**

Definition of center of gravity, moment of inertia, radius of gyration, perpendicular and parallel axis theorems, simple problems on common sections, use of ISI handbook for steel sections.

### **Bending moment and shearing forces**

Cantilever, Simply supported, overhanging beams calculation of BM and SF under dead loads (concentrated and uniformly distributed loads only), BM and SF diagram. Theory of simple bending- bending stresses, neutral axis, moment of resistance, section modulus, modulus of rupture, beams of uniform strength.

### **Deflection of beams**

Relation between deflection, slope and curvature, deflection of cantilever and simply supported beams under concentrated and distributed loads (bending moment area method only)

### **Torsion**

Torsion equation, solid and hollow circular shafts, transmission of power through shafts, closely coiled springs.

### **Thin cylinders**

Subjects to uniform internal pressure

### **Riveted joints**

Types of riveted joints, methods of failure, arrangements of rivets, efficiency of riveted joints.

APPLIED MATHEMATICS – **Cross Check from New Syllabus book if the contents are correct**

## **Sub: Applied Mathematics II**

### **CONTENTS**

**UNIT – 1: LIMITS.**

**6 Hr.**

Variables and Constants. Definition of function. Types of function: Direct and Inverse functions, Explicit and implicit function, Odd and even functions (Definition with examples). Concept of  $x$  tends to ' $a$ '. Definition of limit of a function. Problems on limit of a function by factorization, rationalization when  $x$  tend to ' $0$ ', when  $x$  tend to ' $\infty$ ' and  $x$  tend to ' $a$ '. Derivations of algebraic and trigonometric limits. Problems. Standard limit (only statement)

$$1. \lim_{x \rightarrow 0} \frac{a^x - 1}{x} = \log_e a \quad 2. \lim_{x \rightarrow 0} \frac{e^x - 1}{x} = 1 \quad 3. \lim_{n \rightarrow \infty} \left(1 + \frac{1}{n}\right)^n = e \quad 4. \lim_{n \rightarrow 0} \left(1 + n\right)^{\frac{1}{n}} = e$$

Simple problems on standard limits.

## **UNIT – 2: DIFFERENTIAL CALCULUS.**

**16 Hr.**

Definition of increment and increment ratio. Definition of derivative of a function. Derivatives of functions of  $x^n$ ,  $\sin x$ ,  $\cos x$  and  $\tan x$  with respect to ' $x$ ' from first principle method. List of standard derivatives. Rules of differentiation: Sum, product and quotient of functions. Problems on rules. Derivatives of function of a function (Chain rule). Derivatives of inverse Trigonometric functions, Hyperbolic functions and inverse of hyperbolic functions, Implicit functions, Parametric functions. Problems. Logarithmic differentiation. Problems. Successive differentiation up to second order. Problems.

## **UNIT – 3: APPLICATIONS OF DIFFERENTIATION.**

**6 Hr.**

Geometrical meaning of derivative. Equation of tangent and normal to the curve  $y = f(x)$  at a given point. Derivative as a rate measure. Definition of increasing and decreasing function. Maxima and minima of a function.

## **UNIT – 4: INTEGRAL CALCULUS.**

**14 Hr.**

Definition of Integration. List of standard integrals. Rules of integration (only statement)

$$1. \int k f(x) dx = k \int f(x) dx. \quad 2. \int \{f(x) \pm g(x)\} dx = \int f(x) dx \pm \int g(x) dx$$

problems. Integration by substitution method. Problems. Integrals of functions involving  $a^2 + x^2$ ,  $a^2 - x^2$  and their radicals. Some important integrals of the type

$$1. \int \frac{dx}{x^2 + a^2} = \frac{1}{a} \tan^{-1} \left( \frac{x}{a} \right) + c \quad 2. \int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1} \left( \frac{x}{a} \right) + c \quad \text{with proof.}$$

$$3. \int \frac{dx}{\sqrt{a^2 + x^2}} = \sinh^{-1} \left( \frac{x}{a} \right) + c \quad 4. \int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \log \left( \frac{x-a}{x+a} \right) + c \quad \text{if } x > a > 0.$$

$$5. \int \frac{dx}{a^2 - x^2} = \frac{1}{2a} \log \left( \frac{a+x}{a-x} \right) + c \quad \text{if } a > x > 0. \quad 6. \int \frac{dx}{\sqrt{x^2 - a^2}} = \cosh^{-1} \left( \frac{x}{a} \right) + c$$

$$7. \int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} \sec^{-1} \left( \frac{x}{a} \right) + c \quad (3 \text{ to } 7 \text{ no proof})$$

Integrals of the forms:

$$\int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}, \int \frac{px + q}{ax^2 + bx + c} dx, \int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx. \text{ Problems.}$$

Integration by parts. Rule of integration by parts. Problems.

Integration of the forms:  $\int e^x (f(x) + f'(x)) dx$  Problems.

## UNIT – 5: DEFINITE INTEGRALS.

4 Hr.

Definition of Definite integral. Theorems on definite integrals. Problems. Definite integrals of the type  $\int_0^{\frac{\pi}{2}} \frac{1}{1 + \tan x} dx$ ,  $\int_0^{\frac{\pi}{2}} \frac{1}{1 + \sqrt{\tan x}} dx$  Problems.

## UNIT – 6: APPLICATIONS OF DEFINITE INTEGRALS.

2 Hr.

Find area, volume and r m s value of a function. Problems.

## UNIT – 7: DIFFERENTIAL EQUATIONS.

12 Hr.

Definition, example, order and degree of differential equation with examples. Formation of differential equation by eliminating arbitrary constants up to second order. Solution of D E of first degree and first order by variable separable method. Solution of differential equations reducible to variable separable form. Linear equations and its solution. Solution of differential equations reducible to linear form-Bernoulli's form. Homogeneous form and its solution. Solution of differential equations reducible to homogeneous form. Exact differential equation and its solution. Solutions of differential equation of a type  $a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$ , where a, b, c are constants. Simple problems.

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### Algebra

Solution of quadratic equations – simultaneous equation of two and three unknowns and their solutions using determinants – change of base of logarithms- use of slide rule- approximations- standard limits, Arithmetic, Geometric and Harmonic series – expansion of  $(x/a)^n$  and Log x

### Representation of electrical quantities

Complex quantities in Cartesian polar and exponential forms. Cartesian system  $-y = x^n$  for all values of n – 92, 2, ½, -1, -2, Geometrical construction of trigonometrical function, curve tracing, application to communication systems, Logarithmic scale of graphs.

Vectorial representation of electrical quantities – composition and resolution of vectors, products and quotients of vectors, application to circuits- finding the resultant current, voltage and impedance-plotting of vectors and finding the resultants

### Wave form analysis

Differentiation of product and quotient function of functions-successive and practical differentiation, Maxima, Minima, curvature at a point and curve tracing, integration as an area- definite integrals- methods of integration by substitution by parts, integration of functions in standard forms- applications to problems such as finding the average and RMS values – finding the volumes and surfaces and revolution of regular figures- differential equations, solutions of different equations, their applications, relation of the transient behaviour series and its applications to the solutions of distorted sine waves, triangular, saw tooth and square waves.

### Matric and determinants

Introduction to matrix and evaluation of determinants

## **Boolean algebra**

### **Truth tables and Boolean expansions**

## **NETWORK THEORY AND COMPONENTS**

### **Introduction**

Fundamental ideas of alternating quantities, peak, RMS and average values- form factor, impedance, power factor and phase angle-power in AC circuits, study of RL, RC and LCR series and parallel combinations, complex notation and vector representation

### **Resonance**

Series and parallel resonance- characteristics and application- effects of variation of 'Q' on resonance

### **Coupled circuits**

Indirectly coupled circuits – single and double tuned circuits – co-efficient of coupling and critical coupling, effect of 'Q', bandwidth and frequency response.

### **Networks**

Network theorems – general properties of network characteristics, impedance, types of filters, attenuators, design of simple filters and attenuators, equalisers, introduction to decibel and Neper notations

### **Components**

Introduction – general explanation of components , both fixed and variable used in electronic circuits

### **Resistors**

Various types , their characteristics, uses, ratings and tolerance, potentiometers, temperature, co-efficient of resistors, varactors, thermistor and LDR

### **Inductors**

Types of coils and chokes, smoothing chokes, RF chokes and High 'Q' coils

### **Transformers**

Principles, Transformers rating, No load and load conditions, losses and efficiency, types of transformers, matching transformers

### **Capacitors**

Introduction, various types, their characteristics, uses and rating, special types of condensers, losses.



## **Printed circuits**

Introduction, process applications

## **Sound**

Introduction- range of AF speech, music and noise, volume range and sound levels – threshold of audibility and pain

## **Microphones and Loudspeakers**

Principles and salient features of different microphones and loudspeakers, speaker systems, impedance considerations

## **Sound recording**

Principles of sound recording, disc film and magnetic tape recording

## **ELECTRONIC ENGINEERING II**

### **Power supplies**

Rectifiers- analysis of half wave and full wave rectifiers (valves and semiconductor diodes) harmonics and ripple factor, special rectifier circuits (Mercury arc rectifiers) and polyphase rectifier circuits, vibrators, eliminators and regulated power supply, smoothing circuits, regulated voltage multiplier circuits, typical power supply circuits for different broadcast receivers

### **Amplifiers (valves and transistorised circuits)**

Introduction – Transistor and valve amplifiers, types of bias, equivalent circuits and calculations of voltage gain, Input output impedance, current gain and power gain, different types of coupling – DC, RC, LC and transformer coupling, Neutralisation circuits, Phase inverter circuits, pushpull amplifiers, impedance matching amplifier, classification of amplifiers, grounded grid amplifiers, grounded emitter and grounded cathode amplifiers, grounded collector and grounded plate amplifiers, pentodes for RF amplification, gain consideration of pentodes with tuned and untuned loads, requirements for uniform gain in wide band amplifiers( video amplifiers) requirements and special features of amplifiers in VHP and VLP ranges, **distortion** feedback in amplifiers, Introduction to stereo amplifiers.

### **Measuring instruments**

Elementary idea of measuring instruments and their classification, constructional features of ammeters and voltmeters. Principles of multirange meters, VTVM, audio oscillators

## **COMMUNICATION ENGINEERING I**

### **Oscillators**

Principle requirements of an oscillator and condition for self excitation, frequency stability- feedback, tuned and untuned types, classification, different types of oscillators- Hartley, Colpitts ( tuned grid, tuned plate), crystal, Wein bridge, saw tooth, multi vibrator (astable only) frequency multiplier, phase shift oscillators.

## **Modulators**

Introduction – types of modulation

### **Amplitude modulation**

Principle of amplitude modulation, modulated wave form, voltage frequency and power of the carrier and side bands, depth of modulation and effect of over modulation, different methods of obtaining AM: plate modulation, grid modulation, screen grid modulation, SSB and suppressed carrier system

### **Frequency modulation**

Principle, wave form, deviation ratio, side bands, band width, different methods of obtaining FM – capacity variations, reactance tube, phase modulation, Armstrong method, comparison of FM and AM

### **Pulse modulation**

Definition – PAM, PWM, PPM, PCM

### **AM detection**

Principle- typical diode and triode detector circuits, crystal detector, comparative merits and demerits, output and efficiency distortion, AVC and delayed AVC circuits

### **FM detectors**

Principles of discriminator, phase shift discriminator, ratio detector, limiter circuit

### **Microwave oscillators**

Magnetron and reflex klystron

## **MEASUREMENTS LAB**

1. Semiconductor characteristics
  - a. Junction diode
  - b. Point contact diode
  - c. Zener diode
2. Triode characteristics and Calculations of valve coefficients
  - a)  $E_p$  Vs  $I_p$  /  $E_g = r_p$
  - b)  $E_p$  Vs  $E_g$  /  $I_p = \mu$
  - c)  $E_g$  Vs  $I_p$  /  $E_p = g_m$

3. Transistor characteristics
  - a) Common base characteristics of PNP and NPN
  - b) Common emitter characteristics of PNP and NPN
4. Tetrode characteristics and negative resistances
  - a)  $E_p$  Vs  $I_p$ /  $E_g$  and  $E_{sg} = K$
  - b)  $E_p$  Vs  $I_{sg}$ /  $E_g$  and  $E_{sg} = K$
5. Pentode characteristics  
 $E_s$  Vs  $I_p$ /  $E_g$  and  $E_{sg} = K$
6. Study of photo tube characteristics (LDR and photo tubes)
7. Characteristics of series and parallel resonant circuits
8. Conversion of ammeter to voltmeter, extension of ranges
9. Firing characteristics of thyatron
10. Measurement of resistance by bridge method

#### CONSTRUCTIONS I LAB

1. Soldering practice
2. Components layout and circuit arrangement
3. Construction of power supply with different smoothing circuits and bleeder
4. Vibrator power supply
5. Construction of the following using transistors
  - a. Voltage doubler
  - b. Bridge rectifier
  - c. Eliminator
6. Construction of AF amplifier using valves and transistors
  - a. RC coupled
  - b. Transformer coupled
  - c. Choke coupled
7. Construction of phase invertors using triodes and twin triodes
8. Construction of pushpull amplifier using triodes and pentodes
9. Construction of common base amplifier ( RC coupled)
10. Construction of phase shift oscillators

#### SERVICING I LAB

1. Testing of components
  - a. Resistors
  - b. Capacitors
  - c. Gang condensers

- d. Valves and Transistors
  - e. Inductors
  - f. Power IF and Output transformers
  - g. Loudspeakers and Microphones
2. Location of faults
    - a. Power supply and audio stage of a receiver
    - b. General servicing of all types of amplifiers

## CIRCUIT DRAWING AND TRACING

Schematic representation and standard symbols for various components

Schematic circuit diagram of the following (Valves and Transistor version)

1. Filters, attenuators
2. Power supply( AC, AC/DC, Regulated , DC to DC convertors, Voltage doublers, Triplers, Quadruplers, etc)
3. RC coupled amplifier
4. Transformer coupled amplifier
5. Choke coupled amplifier
6. IF amplifier
7. Pushpull amplifier
8. Oscillators( All types)
9. Multivibrators ( All types)
10. Time base circuits
11. LCR bridges
12. AVO meter
13. VTVM
14. Q meter
15. Multimeter
16. Power supply of Cathode ray oscilloscope
17. Receivers
18. Intercommunication set

## Diploma – III year

### INDUSTRIAL MANAGEMENT

Chapter 1 : Industries and Industrial relations:

#### Introduction

Business organization, Industry, types of industries. A) Continuous – Mass production, flow production. B) Intermittent- Job order production, batch production- characteristics, advantages and disadvantages of the above types of industries, industrial standardisation, simplification, specialisation and their benefits, role of industry in Indian economy - 6hrs

### **Plant Layout**

Introduction, factors influencing the location of plant, plant layout, advantages of scientific layout, types of layout, product layout, process layout, fixed position layout, combination layout, advantages and disadvantages of above types of layout – 5 hrs

### **Labour**

Trade unions, collective bargaining, labour welfare and its advantages, international labour organizations- its objectives and functions, Labour laws, The Indian factory act 1948 – 5 hrs

### **Chapter 2: Principles of management**

Introduction, definition of terms such as organization, management authority, development of management theory, Taylor's principles of management, Fayol's general principle of management – 4 hrs

### **Functions of a Manager (Management)**

Planning, definition, necessity, steps in planning viz. Identification of objectives, determination of policies, procedures and methods – 2 hrs

Organising and staffing: Introduction, Principles, steps involved in setting up a good organisation, organisation charts, types of organisations – line, functional, line and staff, committee organisation, advantages, advantages, limitation of the above types. - 5 hrs

Directing: Introduction, administrative communication – downward communication, upward communication- 1 hr

Motivation: Introduction, Importance of motivation of employees, leadership-qualities and types of leaders – 3 hrs

Controlling: Introduction, the control process, setting standards at strategic points, checking and comparing the actual results with the standards, taking corrective action – 2 hrs

Personnel management: Functions, duties of personnel officer, recruitment procedure, objectives of training, advantages of training, methods of training – 4 hrs

### **CHAPTER 3 Stores and purchasing**

Purchasing: Purchasing procedure, organisation of purchasing department, duties of purchase department

Stores: Functions of store keeping, materials control, control of material utilisation, stock control, and physical verification – 5 hrs

#### CHAPTER 4: Estimation and costing

Estimating: Importance, functions, qualities of an estimation costing, Aims, advantages of efficient costing, elements of cost, labour material, overheads, components of cost, prime cost, factory cost, office cost, total cost, selling prices, problems on above – 6 hrs

Depreciation and obsolescence, causes of depreciation and obsolescence, predetermined costs, Estimated cost, standards cost, process cost – 2 hrs

#### CHAPTER 5: Wages and Incentives

Introduction, Components of wages, dearness allowance, bonus, overtime payment – minimum wages, living wages, fair wages

Methods of wage payment: 1) Time rate system 2) Piece rate system 3) Combination of time and piece rate system. Incentives, essentials of a good incentive plan, a brief note on the standard hour plan, Halsey plan, Rowan plan, Taylor's differential rate systems, Emerson's efficiency plan, Gantt plan – 5 hrs

#### CHAPTER 6: Industrial safety

Introduction, Importance of safety in a workplace, losses due to accident, direct and indirect losses, causes of an accident, preventive measures, role of management, foreman, safety engineer and safety committee – 6hrs

#### CHAPTER 7: Supervision

Introduction, Supervision status in the organization, functions of supervisors, qualities of a good supervisors -3 hrs

#### LINE COMMUNICATION

General principles: Description of public telephone networks

Principles of speech transmission: Telephone instruments, Transmitter, Receivers, Magnetobell (Ringer), Antisidetone, Induction coil

Manual exchange: Magneto and CB switch boards, plug and cord switching, Junction working

Automatic telephone exchange systems: Principles of strowger and common control systems, strowger tuning principles, types of selectors used in strowger systems, typical 25 point and selectors 2000 type two motion selectors, cross bar switch

Circuit elements: Principles, Construction and operation of telephone relay, relay circuits and diagrams, pulse controlled stepping circuit, line signalling circuits, pulse wire and rotary hunting circuits, selector release circuits

Traffic and trunking: Nature of traffic, Units of measurements, traffic variations, Erlang, Full availability, grade of service

Line protection: Main distribution frame, Heat coil and protectors

Power plant: Batteries, principles of charge and discharge, parallel battery float, full battery float systems, Exchange earthing

Typical carrier telephone systems: Three channel and Twelve channel , 126 channel systems, carrier current, voice frequency repeater, hybrid coil, singing, balanced networks, open wire loaded and unloaded co-axial cables, cross talk, attenuation and noise

Description of Public Telephone networks: Line transmission theory for DC transmission, telegraph codes – effect of line constants and transients, single current, double current working, principles of sounders, Teleprinters, Teleprinter transmitters, Automatic transmitters, Teleprinters receivers, Signalling codes- Morse, cable code and five unit code, principles of telex, working and Synchronization

Line communication: Transposition, Interference from power lines

### ELECTRONIC ENGINEERING III

Measuring Instruments:

Cathode ray oscilloscope

Focussing, brightness control, time base deflecting system, triggering circuits, double beam measurements of voltage, frequency and wave forms

Working principles and application of:

Absorption wave meter, frequency meter, signal generators, BFO, Q meters, sweep generators, distortion factor meter, Noise generator and counter.

Industrial electronics:

Photocell: Principles, Photo electric relays, remote light controlled relays, brightness exposure and densitometers

Gas discharge tubes: Principles and simple applications, detectors and radio activities, Industrial applications of gas tubes as rectifiers and control devices

RF Induction heating and Dielectric heating

Electron microscope

Timer circuits, Pulse and Digital circuits

RADAR:

General principles, elementary system, types of indicators, application of radar, VHF radio beacons, altimeters, direction finding, radio compass and radio range, auto alarm devices.

#### FACSIMILE:

Principles of transmission and reception

#### TELEVISION:

General principles, TV Camera, Brief description of TV Transmitters and receivers, Elements of Colour TV

Latest developments:

Basic Logic circuit, elements of Integrated circuits, Introduction to computers, MASER and LASER

#### COMMUNICATION ENGINEERING III

Electromagnetic spectrum, Brief propagation characteristics of different classes of electromagnetic waves, frequency allocation and regulations for radio communication services, various types of emissions and their designations- bandwidth requirements

Receivers:

Communication receivers

Detailed description of superheterodyne AGC systems, tuning and band spread arrangements, Alignment and serving of superheterodyne.

Communication receiver: use of more than one IF band and width and selectivity. Reception of telegraph signals using BFO, reception of FSK signals, typical circuits of limiters and discriminators, advantage of FSK over OOK systems

General features of oscillators used in communication receivers, causes and effects of their instability on reception. AFC systems, diversity reception, function of common oscillators and common AGC, reception of frequency shift duplex signals.

Recording of received telegraphs signals, keying bridges and their purpose and functions

Reception of SSB and ISB signals, advantages of SSB-ISB over DSB systems- study of diagram of SSB/ISB receivers, carrier and SB level considerations, AGC and AFC system.

Modern communication receivers, block diagram, proper usage of aerial rectifiers, oscillators, VFG and crystal, introduction to power amplifiers, Neutralisation, grounded grid amplifiers, feedback systems, output couplings

Components used in high power transmitters such as high power valves, vacuum condensers, coils, protective relays etc. Precautions in handling with power valves

Modulation techniques: Study of broadcast transmitters – study of telegraph transmitters, its control system, drive circuits, OOK and FSK and SSB/ISB transmitters- block diagram SSB/ISB drive, output



couplings, loading, cooling systems, control circuits, safety precautions, procedure for starting and tuning, shutting down transmitters, PA loading, checking various voltage, HT and AUX HTS checking, the performance of transmitters, block diagram of modern WT, RT transmitters, basic principle of telephone terminal.

Broadcast systems:

Principle, elements of broadcasting systems, broadcasting equipments, general considerations for the location of the transmitting centre- relaying station.

VHF, UHF and SHF systems

Generation, Modulation, transmission and reception of frequencies above 30 MHz- typical VHF, UHF and SHF communication systems, special techniques, radio relays, transponder and satellite systems. Special aerials and matching units, Signal to noise ratio considerations, channel capacity in typical systems

## ANTENNAS AND PROPAGATION

Transmission lines and wave guides:

Transmission lines and feeders, Networks with distributed circuit, Constant elementary theory of long lines, terminating, sending and impedance, reflection, travelling waves and standing waves, standing wave ratio, termination and matching, use of stub line, use of quarter wave transformer, coupling between antenna and feeder line.

Antenna:

Effective length and radiation, resistance of quarter wave and half wave aerial, Adcock and Bellini toshi type and their radiation patterns. General description of reflectors arrays, Rhombic antenna etc. for directivity, VHF and Microwave antennas.

Propagation:

Groundwave, Skywave and space wave propagation, propagation characteristics at different frequencies, Ionosphere- its structure, usable frequencies, absorption, skip distance and fading, VHF propagation, satellite communication.

## SEMICONDUCTOR DEVICES AND APPLICATIONS

Transistor physics:

Electron theory- donor and acceptor impurities, Intrinsic and Extrinsic semiconductor, P and N types, germanium and Silicon, PN junction, forward and reverse biasing.

Diodes:

Junction and Point contact diodes – Diodes as a circuit elements, Tunnel diode, Zener diode, Varactor diode, Light emitting Diodes, PIN diodes and SCR

Transistors:

Types of transistors- Junction type and Point contact type – Drift transistor, Field transistor, Uni junction transistor

Transistor amplifier and circuits

Biasing- Equivalent circuit, RC coupled, Transformer coupled for small signals, feedback amplifiers, Multistage amplifiers, Large signal A/F amplifiers, Class A,B and C amplifiers, HF amplifiers, gain bandwidth product

Oscillators:

Principle- RC Oscillator, LC Oscillator, Negative resistance oscillators.

DC Amplifiers:

Drift problem- compensation technique, the differential amplifier, stabilisation techniques.

Power pack:

Regulation- series and shunt protective circuits

Switching circuits:

Diodes and Transistors as switches, Multivibrators- astable, monostable, bistable counters, Logic circuits

Integrated Circuits:

Application, Digital and Analogue (Linear)

## MEASUREMENTS II LAB

1. Measurements of capacitors
2. Measurements of inductors
3. Measurement of coupled circuits
4. Determination of dynamic valve characteristics
5. Determination of transistor parameters
6. Response of cascade amplifiers
7. Measurement of receiver characteristics
8. Modulation measurements by using Cathode ray oscilloscope
9. Measurements of audio power and distortion
10. Measurements of RF power and voltage SWR
11. Measurements of varactor diode
12. Measurements of discriminator characteristics

## CONSTRUCTION II LAB

1. Constructions of the following in printed circuit boards
  - a. Hartley oscillator
  - b. Collpits oscillator
  - c. Dynatron oscillator
  - d. Crystal oscillator
  - e. Multivibrator ( Bi stable and flip flop circuits)
2. Construction of saw tooth generator
3. Construction of regulated power supply
4. Construction of audio amplifiers
5. Pushpull amplifier with driver
6. Construction of common emitter amplifier
7. Construction of Timer circuit
8. Construction of photocell relay ( LDRO)
9. Construction of medium wave transistor receiver
10. Construction of basic logic circuits
11. Clipper circuits
12. Clamping circuits

## LINE COMMUNICATION LAB

1. Simplex working with
  - a. Relays
  - b. Sounders
2. Duplex working with
  - a. Relays
  - b. Sounders
3. Calibration of relays
4. Study of telephone instruments
  - a. IL receiver
  - b. Split armature receiver
  - c. Transmitter
  - d. Inductive coil
5. Study of Uniselectors : BHO No. 2 , APO No. 3
6. Study of two motion selector – 2000 type
7. Study of teleprinter
8. Morse code sending and receiving practice
9. Experiments on:
  - a. Low pass filter
  - b. High pass filter
  - c. Band pass filter
  - d. Resonance
  - e. BEF

#### 10. Cable tests

- a. Murray loop test
- b. Varley loop test

### SERVICING II

1. Testing of radio component
  - a. Transformers( Mains and Output transformers)
  - b. IF transformers
  - c. Oscillators and antenna coils
2. Alignment procedure
3. Location of faults in a radio receiver
4. General servicing of amplifiers, meters and other lab equipments
5. Servicing of stereo amplifiers

### SEMICONDUCTOR DEVICES AND APPLICATION

1. RC coupled amplifiers- frequency response measurements , distortion analysis
2. Class B pushpull audio amplifiers- measurement of distortion,power output and frequency response
3. Two stage IF amplifier and detector, measurement of gain and bandwidth
4. Hartley oscillator- frequency measurement, observation of output waveform on CRO with change in feedback
5. Astable multivibrator – change of duty cycle
6. Monostable Multivibrator – variable pulse width
7. Decade counter
8. Basic logic gates – AND, OR, NAND, NOR, NOT
9. Saw tooth generator, improvement in linearity with zener controlled power supply
10. DC to DC converters
11. Writing using IC – OP Amps
12. Writing using IC-Logic gates and counter
13. Realization of OR,NOT,AND gates using NAND( IC 7400)