

## TS ECET-2019

### SYLLABUS FOR ELECTRONICS AND COMMUNICATION ENGINEERING

#### MATHEMATICS (50 Marks)

##### Unit-I: Matrices

Matrices: Definition of Matrix, Types of matrices-Algebra of matrices-Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Properties-Laplace's expansion-singular and non singular matrices - Adjoint and multiplicative inverse of a square matrix-System of linear equations in 3 variables-Solutions by Cramer's rule, Matrix inversion method-Gauss-Jordan method.

Partial Fractions: Resolving a given rational function into partial fractions.

Logarithms: Definition of logarithm and its properties, meaning of 'e' exponential function and logarithmic function.

##### Unit-II: Trigonometry

Properties of Trigonometric functions- Ratios of Compound angles, multiple angles, submultiple angles - Transformations of Products into sum or difference and vice versa- Simple trigonometric equations-Properties of triangles-Inverse Trigonometric functions, Hyperbolic functions.

Complex Numbers: Properties of Modulus, amplitude and conjugate of complex numbers, arithmetic operations on complex numbers-Modulus-Amplitude form (Polar form) - Euler form (exponential form)-Properties.

##### Unit-III: Analytical Geometry

Straight Lines-different forms of Straight Lines, distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines. Circles-Equation of circle given center and radius, given ends of diameter-General equation-finding center and radius, center and a point on the circumference, 3 non-collinear points, center and tangent, equation of tangent and normal at a point on the circle.

##### Unit-IV: Differentiation and its Applications

Functions and limits - Standard limits - Differentiation from the First Principles - Differentiation of sum, product, quotient of functions, function of function, trigonometric, inverse trigonometric, exponential, logarithmic, Hyperbolic functions, implicit, explicit and parametric functions-Derivative of a function with respect to another function-Second order derivatives - Geometrical applications of the derivative(angle between curves, tangent and normal)-Increasing and decreasing functions-Maxima and Minima(single variable functions) using second order derivative only - Partial Differentiation-Partial derivatives up to second order-Euler's theorem.

##### Unit-V: Integration and its Applications

Indefinite Integral - Standard forms - Integration by decomposition of the integrand, integration of trigonometric, algebraic, exponential, logarithmic and Hyperbolic functions-Integration by substitution -Integration of reducible and irreducible quadratic factors - Integration by parts- Definite Integrals and properties, Definite Integral as the limit of a sum -

Application of Integration to find areas under plane curves and volumes of Solids of revolution— Mean and RMS value, Trapezoidal rule and Simpson's 1/3 Rule for approximation integrals.

### **Unit–VI: Differential Equations**

Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of the type first order, first degree, variable-separable, homogeneous equations, exact, linear differential equation of the form  $dy/dx+Py=Q$ , Bernoulli's equation, nth order linear differential equation with constant coefficients both homogeneous and nonhomogeneous and finding the Particular Integrals for the functions  $e^{ax}$ ,  $x^m$ ,  $\sin ax$ ,  $\cos ax$  or a polynomial of m-th degree( $m=1,2$ ).

### **Unit–VII: Laplace Transforms**

Laplace Transforms (LT) of elementary functions-Linearity property, first shifting property, change of scale property multiplication and division by t-LT of derivatives and integrals, Unit step function, LT of unit step function, second shifting property, evaluation of improper integrals, Inverse Laplace transform (ILT) - shifting theorem, change of scale property, multiplication and division by p, ILT by using partial fractions and convolution theorem. Applications of LT to solve ordinary differential equations to solve ordinary differential equations up to second order only.

### **Unit–VIII: Fourier Series**

Define Fourier series, Euler's formulae over the interval  $(C, C+2\pi)$  for determining the Fourier coefficients. Fourier series of simple functions in  $(0, 2\pi)$  and  $(-\pi, \pi)$ . Fourier series for even and odd functions in the interval  $(-\pi, \pi)$ .

## **PHYSICS (25Marks)**

### **Unit-I: Units and dimensions:**

Physical quantity-fundamental and derived physical quantities-units-fundamental and derived units-SI units-multiples and sub-multiples in SI units-advantages of SI units-dimensions and dimensional formulae-dimensionless quantities- applications and limitations of dimensional analysis-problems.

### **Unit-II: Elements of vectors:**

Scalar and vector quantities-examples-types of vectors-addition and subtraction of vectors-triangle law-parallelogram law-polygon law-resolution of a vector-unit vectors(i,j,k)-dot product and cross product of two vectors- characteristics of dot and cross products-examples- problems.

### **Unit-III: Kinematics and Friction**

Equations of motion-acceleration due to gravity-equations of motion under gravity- projectile motion-examples-horizontal and oblique projections-expressions for maximum height, time of ascent, time of flight, horizontal range, problems. Friction- causes and types of friction-normal reaction-laws of friction-coefficients of friction-angle of friction-methods of reducing friction-advantages and disadvantages of friction-motion of a body over a rough horizontal surface— problems.

#### **Unit-IV: Work, Power and Energy**

Work, power and energy-definitions and units-potential and kinetic energies-examples and expressions-work-energy theorem – law of conservation of energy-problems.

#### **Unit-V: Simple harmonic motion and Sound**

Definition-conditions of SHM - examples of SHM - expressions for displacement, velocity, acceleration, time period, frequency and phase of SHM-time period of a simple pendulum-seconds pendulum-problems. Sound-musical sound and noise-noise pollution-Effects and methods of control of Noise Pollution-Beats and echo's-problems-Doppler effect– Explanation, and Applications --Reverberation-Sabine's formula-characteristics of a good building-problems.

#### **Unit-VI: Heat and Thermodynamics**

Expansion of gases-Boyle's law-Absolute scale of temperature-Charles laws-Ideal gas equation-Universal gas constant and its value-SI Units-problems-- isothermal process-adiabatic process-first law of thermodynamics - two specific heats of a gas-relation between  $C_p$  and  $C_v$ -problems-second law of thermodynamics.

#### **Unit-VII: Modern physics**

Photo electric effect–explanation and its laws-applications of photo electric effect(photo cell)-Einstein's photoelectric equation–critical angle and total internal reflection– optical fibers - principle, working, types and applications-concept of super conductivity – and applications.

### **CHEMISTRY (25 Marks)**

#### **Unit I: Fundamentals of Chemistry:**

**Atomic structure:** Introduction-Fundamental particles – Bohr's theory – Quantum numbers – Aufbau's principle – Hund's rule – Pauli's exclusion principle- Electronic configurations of elements up to atomic number 30, shapes of **s**, **p**, **d** orbital's.

**Chemical Bonding:** Introduction – types of chemical bonds – Ionic bond taking example of NaCl and MgO –characteristics of ionic compounds and covalent bond taking example  $H_2$ ,  $O_2$ ,  $N_2$ , HCl, characteristics of covalent compounds-Coordinate covalent bond.

**Oxidation-Reductions:** concepts of Oxidation-Reduction, Oxidation number and its calculations, differences between oxidation number and Valency .

#### **Unit-II: Solutions:**

Introduction classification of solutions, solute, solvent, concentration, mole concept–Molarity, – Normality, equivalent weight using acids, bases and salts, numerical problems on Molarity and Normality.

### **Unit-III: Acids and Bases:**

Introduction – theories of acids and bases – Arrhenius, Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water - pH and related numerical problems – buffers solutions – Applications.

### **Unit – IV: Principles of Metallurgy:**

Characteristics of metals and distinction between metals and non-metals. Definitions of metallurgy, ore, gangue, flux, slag–concentration of ore-hand picking, levigation, froth floatation – extraction of crude metal – roasting calcination, smelting – alloys – composition and uses of brass, German silver and nichrome.

### **Unit-V: Electrochemistry:**

Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series –emf and numerical problems on emf of a cell.

### **Unit –VI: Corrosion:**

Introduction – factors influencing corrosion - electrochemical theory of corrosion-composition cell, stress cell and concentration cells - rusting of iron and its mechanism – prevention of corrosion by (a) coating methods, (b) cathodic protection (sacrificial and impressive voltage methods).

### **Unit-VII: Water Technology:**

Introduction – soft and hard water – causes of hardness – types of hardness –disadvantages of hard water – degree of hardness, units and Numerical problems– softening methods – permutit process – ion exchange process – qualities of drinking water – municipal treatment of water for drinking purpose - Osmosis and reverse Osmosis, advantages of reverse Osmosis.

### **Unit-VIII: Polymers:**

Introduction – polymerization – types of polymerization – addition, condensation polymerization with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics, thermo plastics and thermo setting plastics– differences between thermo plastics and thermo setting plastics- preparation and uses of the following plastics: 1. Polythene, 2. PVC, 3. Teflon, 4. Polystyrene, 5.Urea formaldehyde – Rubber – natural rubber – processing from latex –Vulcanization – Elastomers – Butyle rubber Buna-s, Neoprene rubber and their uses.

### **Unit-IX: Fuels:**

Definition and classification of fuels based on physical state and occurrence – characteristics of good fuel - composition and uses of gaseous fuels. (a) Water gas, (b) producer gas, (c) natural gas, (d) coal gas, (e) bio gas, (f) acetylene.

### **Unit-X: Environmental Chemistry:**

Introduction – environment – understand the terms lithosphere, hydrosphere, atmosphere bio sphere, biotic component, energy component pollutant, receptor, sink, particulate, DO, BOD, Threshold limit value, COD - Air pollution - causes-Effects- Forest resources, uses and

over exploitation, deforestation acid rain, green house effect –ozone depletion – control of Air pollution – Water pollution – causes – effects – control measures. Renewable and Non Renewable energy sources – concept of ecosystem – producers, consumers and decomposers – Biodiversity, threats to Biodiversity.

## **ELECTRONICS AND COMMUNICATION ENGINEERING (100 Marks)**

### **UNIT I: ELECTRONIC DEVICES AND CIRCUITS:**

Semiconductor diodes – varactor diode – zener diode – Clippers and clampers-Transistors– FETs – UJT (characteristics only) – Power supplies – Rectifiers and Filters – HW, FW and Bridge type – RC , LC and CLC filters – Series and Shunt regulators, IC regulators – Transistor amplifiers – CE, CC and CB configurations – Biasing techniques-RC coupled – Transformer coupled amplifiers Differential amplifiers – Feedback, Power and Tuned amplifiers – Operational amplifiers – characteristics and applications – RC, LC and Crystal oscillators – Astable , Bistable and Monostable Multivibrators using 555 timers- Schmitt Trigger – Sweep circuits – Miller and Bootstrap circuits, VCO, PLL- Fabrication of ICs.

### **UNIT II: CIRCUIT THEORY:**

Ohms' Law, KCL & KVL-Mesh current and Node voltage analysis – Cramer's Rule – Concept of Graph-nodes, junctions, loops, Co-tree, tree, twig -tie set-cut set- Network theorems – Thevenin's, Norton's, Maximum Power transfer, Superposition and Reciprocity theorems– Star to Delta and Delta to Star transformations. Series and Parallel Resonance – Q- factor – Selectivity – Bandwidth- Coupled circuits, Transient analysis-RC and RL, Linear wave shaping circuits. Transmission Lines – Characteristic Impedance –Reflection Coefficient – SWR – Transmission Line losses and Impedance matching.

### **UNIT III: ELECTRONIC MEASURING INSTRUMENTS:**

Analog Instruments – Extension of range of Ammeter, Voltmeter and Ohmmeter – FET voltmeter – Differential voltmeter- Bridges-Wheatstone, Maxwell, Schering – Digital instruments – successive approximation – digital frequency meter-digital LCR meter- CRO – CRT – time base generator – deflection sensitivity – triggered sweep circuits – CRO applications, AF Oscillator – RF Signal generator – AF Power meters – Q meter – Distortion Factor Meter –spectrum analyser-XY plotters.

### **UNIT IV : Programming in 'C' :**

Data types – arithmetic operations – operators & expressions – control statements – functions – parameter passing – Arrays – pointers – structures.

### **UNIT V : INDUSTRIAL ELECTRONICS:**

Thyristor family – SCR, TRIAC, Power BJT –IGBT (characteristics, working principle and applications) — Off Line and On Line UPS –Working & Applications SMPS – Working Servo stabilizer-Opto electronic devices – LDR (characteristics and applications) – Transducers – LVDT – Strain Gauge, Thermocouple - Ultrasonic - Pulse echo flaw detector –Classify Industrial heating methods-induction and dielectric heating- Types of electrical welding- resistive welding- applications- Architecture of PLCs- ladder symbols-diagram – Ladder

program-List PLCs types-features of Siemen's, Allenbradly-applications of PLCs- Block diagram of Open and Closed loop Control system-merits and demerits of open loop system.

#### **UNIT VI :COMMUNICATION SYSTEMS:**

Analog – Need for modulation – Types of modulation – AM, FM , PM – Modulation Index – Bandwidth – Power requirements – Transmitters – Low level and High level types – Receivers – Block diagram of TRF and its limitations-Super heterodyne – Nerd for AVC-Fading-AM and FM receivers – IMRR and choice of IF – Wave Propagation – Ground, Sky and Space waves – Properties. Digital – Pulse modulation – PCM, Delta modulation – Data codes – error detection and correction - digital modulation – ASK, FSK, PSK and QAM – generation and detection – Multiplexing – TDM , FDM – Multiple Access – TDMA, FDMA –PSTN, ISDN – need for MODEM-types-cable, FAX, DATA - Internet Telephony.-Antennas– radiation resistance – beam width – polarization – directivity – efficiency – bandwidth – gain – front to back ratio – folded dipole – arrays – broadside – end fire – Yagi, Turnstile antennas-loop antenna-horn-helical-Binomial antenna – Parabolic reflectors – beam width, gain and applications. Wave Guides – Rectangular – Dominant mode – Phase and Group velocity – Cut off wavelength - working principle and applications of Magnetron, Klystron, TWT– Radar – range equation – Pulsed radars – indicators – duplexers – CW radars and MTI radars–ILS– Satellite communication – UP link and DOWN link frequencies – types of satellites – satellite on board – earth station systems – satellite applications– GPS .

#### **UNIT VII :DIGITAL ELECTRONICS:**

Number systems – Logic gates – Boolean algebra – Adders and Subtractors, Multiplexers, De multiplexers-Encoders-decoders, Comparators – Flip-flops– Registers and Counters – Memories – RAM, ROM, Flash ROM, NVROM, Cache Memory, Virtual Memory, Associative Memory – D/A converters – binary weighted – R-2R Ladder, A/D Converter - Counter and Successive approximation types.

#### **UNIT VIII : MICROCONTROLLERS, PROGRAMMING, INTERFACING & APPLICATIONS –**

Block diagram 8085 - 8051 Architecture – Instruction Set – subroutines – use of input and output machine related statements – time delay program – peripheral ICs – 8255 use of ADC 0808/ADC0809 and DAC0808/DAC0809 – Interfacing of RTC.-Interfacing &-Segment display –LCD 4X 4 matrix –Key board matrix –RS-232-DB25 & DB9 connector –MAX 232 & 233 -8051 Programming in C-I/O Programming bit wise, byte wise – 8051 Applications – need of relay, opto coupler for interfacing –Stepper motor – Speed control of dc motor using PWM – Water level controller – lift controller –Advanced micro controller – Architecture of PIC - features of PIC – PIC 16F877-ARM –RISC Architecture

#### **UNIT IX : CONSUMER ELECTRONICS :**

Recording and Reproduction of Sound using Magnetic and Optical methods – Television Picture elements – scanning and synchronization – blanking and interlacing – composite video signal, flicker, CCIR standards – Color TV – Additive and subtractive mixing – types of color TV systems – NTSC, PAL and SECAM – PAL system processing – DTH system – Cable TV – HDTV.-features of Smart TV- working principle of Microwave Oven –Block diagram of Electronic Washing machines – Block diagram of Camcorder .

**UNIT X : DATA COMMUNICATIONS AND COMPUTER NETWORKS:** Transmission Media – Twisted pair – UTP –STP –Coaxial cable – Optical fiber – comparison – Shannon Capacity theorem – Network Topologies – BUS, STAR, RING – switching – Packet and Circuit switching – OSI 7- layer model and functions – CSMA and token ring – properties and operations – Wireless LAN – Bluetooth technology – WAN architecture – Packet transmission – ARPA Net – ISP and ISDN architectures – WAN Protocols – TCP / IP features and comparison –Ports and Sockets – Domain Name System – Email – File transfer protocol – Proxy server and Web server architecture-list HTTP commands –security services-message confidentiality-message integrity –message authentication –entity authentication –IOTS –its applications – Web Browser Architecture-key management-digital signature-firewalls in securing networks

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## TS ECET-2019

### MODEL QUESTIONS FOR ELECTRONICS AND COMMUNICATION ENGINEERING

#### MATHEMATICS

1. If  $\omega$  is a cube root of unity then  $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} =$ 
  - 1) 0
  - 2) 1
  - 3) -1
  - 4) 2
  
2. If  $\frac{2x+5}{(x+1)^4} = \frac{A}{(x+1)^2} + \frac{B}{(x+1)^4}$  Than (A,B)=
  - 1) (1,2)
  - 2) (1,3)
  - 3) (2,3)
  - 4) (2,4)
  
3.  $\text{Tan}^{-1}(1/2) + \text{Tan}^{-1}(1/3) =$ 
  - 1) 0
  - 2)  $\frac{\pi}{3}$
  - 3)  $\frac{\pi}{6}$
  - 4)  $\frac{\pi}{4}$
  
4.  $\int_0^{\frac{\pi}{2}} \log (\cot x) dx =$ 
  - 1) 1
  - 2) 0
  - 3)  $2\log 2$
  - 4) None
  
5. The differential equation  $\frac{dy}{dx} + \frac{ax+by+g}{hx+by+f} = 0$  is called
  - 1) Homogenous
  - 2) Linear
  - 3) Exact
  - 4) None

## PHYSICS

- 1) Dimensional formula for stress
  - 1)  $ML^2T^{-3}$
  - 2)  $ML^{-1}T^{-2}$
  - 3)  $ML^0T^{-2}$
  - 4)  $MLT^{-1}$
- 2) On which principle optical fiber works
  - 1) Reflection
  - 2) Refraction
  - 3) Total internal reflection
  - 4) Total internal refraction
- 3) Relation between centigrade and Kelvin scale of temperature
  - 1)  $T=t+273$
  - 2)  $T=t-273$
  - 3)  $t=T+273$
  - 4)  $t=T-273$
- 4) Find the dot product of two vectors  
 $A=2i+3j+4k$  and  $B=4i-2j+3k$ 
  - 1) 26
  - 2) 14
  - 3) 22
  - 4) 0
- 5) A work done by a man in carrying a load of 60 Kg over his head when he travels a distance of 5m in horizontal direction is ( $g=9.8 \text{ m/s}^2$ )
  - 1) 2940 J
  - 2) 0J
  - 3) 2940m
  - 4) 300J

## CHEMISTRY

1. The Oxidation number of Mn in  $MnO_4^-$  is
  - 1) +5
  - 2) +6
  - 3) +7
  - 4) +4
2. The molarity of 10% NaOH solution is
  - 1) 0.025
  - 2) 0.25
  - 3) 2.5
  - 4) 25
3. Galvanic cells are the cells which convert
  - 1) Electrical energy to chemical energy
  - 2) Chemical energy to electrical energy
  - 3) Chemical energy to Mechanical energy
  - 4) Potential energy to Kinetic energy
4. The exhausted cation exchange resin can be regenerated by using
  - 1) NaCl
  - 2) NaOH
  - 3) HCl
  - 4)  $NH_3$
5. Which of the following is not a Lewis base



- 1) H<sub>2</sub>O      2) BF<sub>3</sub>      3) NH<sub>3</sub>      4) CH<sub>3</sub>OH

## **ELECTRONICS AND COMMUNICATION ENGINEERING**

1. Mention the type of feedback used in Oscillator
  - 1) Positive feedback
  - 2) Negative Feedback
  - 3) Both
  - 4) None of the above
  
2. What is the effect of beam width of beam on directivity of an antenna?
  - 1) Directivity increases beam width increases
  - 2) Directivity of the antenna decreases if beam width increases
  - 3) Directivity decrease, Beam width decreases
  - 4) None of the above
  
3. Which capacitor affects low frequency gain of a RC Coupled Amplifier?
  - 1) By pass Capacitor
  - 2) Coupling Capacitor
  - 3) Bypass& Coupling capacitor
  - 4) None of the above
  
4. What is the limitation of CW Radar
  - 1) It will not determine range of the target
  - 2) determines amplitude of echo
  - 3) determines azimuth
  - 4) determines elevation
  
5. Which microwave tube is a cross-field type
  - 1) TWT
  - 2) Reflex Klystron Oscillator
  - 3) Gunn Oscillator
  - 4) Magnetron Oscillator