**Hu-201: COMMUNICATION IN ENGLISH-II**

1. **Speaking**

Eliciting – information, directions, clarification, help.

Expressing – thanks, requirements, opinions, confirmation, apology, want/ need, information,

Complaints, reasons/ justifications.

Reporting – description, decisions

Narrating – sequence of events

Facing – job interviews

1. **Writing**

Structure and integrate information into cohesive and coherent paragraphs and texts for target audience while:

Writing General – Specific paragraphs (paragraph writing)

Writing Process – Description paragraphs (essay article)

Writing Problem – Solution paragraphs, comment paragraphs (amplification)

Writing technical reports (short)

Writing letters – asking for quotation, placing orders, of complaints, of adjustments.

Writing job applications – Covering letters and Curriculum Vitae.

**Role of learner**: The learner should be motivated to actively participate in the comprehension and oral production. Their roles mostly are as presenter, receiver, thinker and negotiator of information.

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**Sc-202: MATHEMATICS – II**

GROUP – A: DIFFERENTIAL CALCULUS (Marks: 25)

1. Variables and Constants:
   1. Dependent and independent variables.
   2. Absolute and Arbitrary constants.
   3. Domain of a variable.
2. FUNCTION – ITS MEANING AND APPLICATION IN ENGINEERING FIELD
   1. Function – its definition and examples.
   2. Different types of functions.
   3. Domain and range of functions.
3. LIMIT OF A FUNCTION
   1. Definition of limit of a function from both analytic and geometric concepts.
   2. Algebra of limits.
   3. Standard limits – statements only.
   4. Illustrative examples on limit.
4. CONTINUITY OF A FUNCTION AT A POINT
   1. Definition of continuity of a function from both analytic and geometric concept.
   2. Difference between limit and continuity of a function at an arbitrary point.
   3. Illustrative examples.
5. DIFFERENTIATION OR DERIVATIVE OF A FUNCTION
   1. First Principle of differentiation.
   2. Differentiation of some standard functions from first principle.
   3. Fundamental theorems on differentiation.
   4. Derivative of function of a function, implicit function and parametric function.
   5. Derivative as a rate measure.
   6. Engineering application of derivative as a rate measure.
   7. Equation of tangent and normal.
   8. Second order derivative.
   9. Engineering importance of second order derivative (acceleration etc.)
6. MAXIMA AND MINIMA OF A FUNCTION AT A POINT
   1. Concept of increasing and decreasing function.
   2. Necessary condition for maximum and minimum.
   3. Determination of maxima and minima of an arbitrary function.

GROUP – B: INTEGRAL CALCULUS (Marks: 20)

1. Integration – The Inverse process of differentiation, integrand, integral and primitive.
   1. Indefinite integration – constant of integration
   2. Some standard integrals.
   3. Method of integration.
   4. Evaluation of integrals by using methods of integration.
2. Definite Integral

2.01 Fundamental theorems of definite integral.

2.02 Practice on definite integral.

3.0 Area under curve.

3.01 Area under the curve such as circle, parabola, ellipse and straight line. (Simple)

GROUP – C: CO-ORDINATE GEOMETRY OF TWO DIMENSIONS (Marks: 25)

1.0 Co-ordinates – Rectangular/ Cartesian Co-ordinates/ Polar Co-ordinates and their relations.

1.01 Distance between two given points.

1.02 Point dividing line joining two given points (externally and internally) in a given ratio.

1.03 Practice on the above two units.

2.0 Area of Triangle.

2.01 Area of a triangle whose vertices are given.

2.02 Illustrative examples.

3.0 Straight line

3.01 Standard forms of the equation of a straight line (Gradient, Intercept forms etc.)

3.02 Point of intersection of straight lines.

3.03 Equation of a straight line through the point of intersection of two given lines.

3.04 Collinearity of three given lines.

3.05 Angles between two straight lines.

3.06 Conditions of parallelism and perpendicularity.

3.07 Examples related to different forms of straight lines.

4.0 Circle – laws

4.01 Equation of a circle.

4.02 Equation of a circle through three given points.

4.03 Tangent and normal to a circle (calculus method may be used).

4.04 Condition of tangency.

4.05 Practice on equations of circle under different forms.

5.0 Conic – laws

5.01 Standard equations of conic – parabola and ellipse.

5.02 Focus, Directrix and eccentricity of conic, Latus Rectum.

5.03 Tangent and normal to a conic.

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**CHEMISTRY – II (Sc – 203)**

**(Total marks – 100 Theory – 70 Sessional - 30)**

**Unit - 1: Environmental Chemistry**

* 1. Definition of pollution, types of pollution, pollutants.
  2. Water pollution – causes, monitoring and osmilation, effuluent, upstream and downstream.
  3. Parameters – pH, BOD, COD, turbidity, hardness (total carbonate and non-carbonate), testing for sewage contact (NH3, NO2-, NO3-).
  4. Air and soil pollution, causes, pollutants.
  5. Economical imbalance, prevention and control of pollution.

**Unit – 2: Metallurgy**

2.1 General principles of metallurgy – mineral, ore, gangue, slag, flux.

2.2 Manufacture of cast-iron.

2.3 Manufacture of steel – Bessemer, open hearth, LD-process.

**Unit – 3:** Raw materials, manufacture, types of cement.

**Unit – 4: Fuel**

4.1 Importance of fuels in industries, definition and classification of fuels, combustion of fuels, calorific value and its unit. Distinguish between gross (or higher) and net (lower) calorific value.

4.2 Solid fuel

State and explain the origin of coal, classification of coal by tank, pulverized coal, principles of carbonization of coal, distinguish between low temperature carbonization of coal and high temperature carbonization of coal.

4.3 Liquid fuel

Definition of petroleum or crude oil, classification of three varieties of crude oil namely paraffin-base type. Fractional distillation of crude petroleum, state and explain important properties of liquid fuels namely-flash and fire point, smoke point, aniline point, knocking, octane number, anti-knocking properties.

4.4 Gaseous fuel

State, composition, properties and industrial application of coal, water gas, producer gas, LPG, natural and gobar gas.

**Unit – 5: Lubricants**

Define lubricant and lubrication. Mention the major functions of a lubricant, definition of lubricating oil, grease, solid lubricants and lubricating emulsion with their application.

**Unit – 6: Corrosion**

6.1 Definition and causes of corrosion.

6.2 State the different types of corrosion of metal.

6.3 Explain chemical corrosion and mention the names of corrosion products.

6.4 Explain rusting of iron.

6.5 Name the various methods of corrosion control.

**Unit – 7 : Plastics and Polymer**

7.1 Definition, types of polymerization, classification of polymers.

7.2 State the properties of thermoplastics and thermosetting polymers.

7.3 Name important plastic materials with their properties and uses namely polithine, polypropylene, polystyrene, PVC, Nylon, Terelene, Neoprene, Perspex, Bakelllite, Urea formaldehyde and formica.

**Unit – 8: Organic Chemistry**

8.1 Nomenclature, structure and shapes of hydrocarbons, alkanes – structures, isomerism, stereo isomerism, chirality, optical activity of alkanes-cis-trans isomerism.

8.2 Laboratory preparation of alkane, alkene and alkines and their properties.

8.3 Oxydation, addition, substitution, free radical, electrophilic, neucleophilic and elimination reactions.

8.4 Important derivatives of benzene.

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**Sc-204: APPLIED PHYSICS - II**

1. **LIGHT**
   1. Reflection, Reflection on spherical mirror, idea of real and virtual image, mirror formula, sign conventions (mirror formula to be assumed), nature size and position of images of different positions of objects, numerical problems.
   2. Refraction, refractive index, critical angle, total internal reflection, between critical angle and refractive index, Prism, refraction through prism, minimum deviation, numerical problems. Lens, refraction through lens (lens formula to be assumed of a lens), numerical problems.
2. **MAGNETISM**
   1. Nature and artificial magnets theories, different types of magnets, induced magnetism, nature of polarities.
   2. Inverse square law, magnetic intensity at end – on and broad – side on position, uniform and non – uniform field, magnetic moment, couple on a magnet in a uniform field, Tangent law.
   3. Elements of terrestrial magnetism
3. **ELECTROSTAICS**
   1. Concept of Electric charge according to modern electron theory, unit of charge, Inverse square law, electric field, Electric line of force, electric intensity
   2. Potential at a point due to a point charge, relation between intensity and potential with deduction of the formula
   3. Capacity of a condenser, series and parallel combination, different type of condenser, numerical problems.
4. **CURRENT ELECTRICITY**
   1. potential difference and electric current with their units
   2. Simple voltaic cell; Difference type of cell; difference between e. m .f. and p. d.; internal resistance of cell. Defects of cell, local action and polarization and its removal.
   3. Storage Cell, lead and Edison accumulator, difference between primary and secondary cells, grouping of cells, series, parallel and mixed combinations of cells.
   4. Basic D.C. Circuits: Ohm’s Law and its verification, mathematical expression, Kirchoffs Law, numerical problems.
   5. Definition of resistance, conductance, effects of temperature on resistance, Series and parallel combination of resistance, resistance per unit length, numerical problems.
   6. Heating Effect of Current: joules law experimental verification of Joule’s Law, electricity energy and power, numerical problems
   7. Thermo – Electricity: See – Beck effect, Verification of thermo e. m. f., application of thermo – electricity, thermopile, Thermo electric thermometer, Peltier effect and Thomson effect.
   8. Chemical Effect of current: electrolysis theory of electrolytic dissociation, water voltammeter, Faradays’ Laws of Electrolysis, electro – Plating.
5. **ELECTROMAGNETISM**
   1. Magnetic effect of current, nature of magnetic field due to straight and circular conductor, due to solenoid, Fleming’s left hand and right hand rules, effect of current following through two parallel conductors.
   2. Electro Magnetic induction: e. m. f. induced in a coil due to magnet, Faraday’ s laws of electro – magnetic induction, Lenz Law, self and mutual induction.
6. **MODERN PHYSICS**
   1. Photo Electric Emission: Explanation and demonstration of photo electric current, deduction of equation, photo electric equation with its physical signification of photo emission (Photo – electric cell)
   2. Nuclear Energy: Atomic mass unit, mass energy equivalence, mass defect
   3. X – rays Properties and its application in industry (Production apparatus not necessary)
   4. Radio – activity, nature and artificial radioactivity, emission of alpha, beta and gamma radiation, their properties and uses.
7. **ELECTRONIC**
   1. Thermionic Emission; Vacuum tube, diode and triode, their working principal, concept of rectifier and amplifier, use of diode as rectifier.
8. **SEMI – CONDUCTOR PHYSICS**

8.1 Concept of semi conductors, properties and basic principle, intrinsic and extrinsic semi conductor, p-type and n-type semi conductor.

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**Me-201: ENGINEERING MECHANICS (End Term marks: 70; Pass Mark: 28)**

1. Introduction:
   1. Concept of Engineering Mechanics, engineering applications
   2. Units of measurement: basic units and derived units, different unit systems (FPS, CGS, MKS, SI), conversion of measurement from one system to another for density, force, pressure, work, power, velocity, acceleration.
2. System of Forces
   1. Concept and definition of force; effects of a force; graphical (vector) representation of a force; principle of physical independence of forces; principle of transmissibility of forces; system of forces.
   2. Composition and resolution of co-planar forces.
      1. Resultant force; Composition of forces; parallelogram law of forces; resolution of forces.
      2. General laws for resultant force – Triangle law, Polygon law of forces.
      3. Graphical (vector) method for the resultant force – position diagram, Bow’s notation, force diagram.
   3. Concept of moment; moment of a force; graphical representation; units of moment; Varignon’s Principle; Position of resultant force by moments; application of moments in simple lever.
   4. Co-planar non-concurrent parallel forces – resultant force of two like and unlike parallel forces; Graphical method for the resultant of parallel forces; Couple – arm of a couple; moment of a couple; resultant of coplanar couples.
   5. Equilibrium of co-planar concurrent forces – Principle of equilibrium; Lami’s theorem for the equilibrium of coplanar forces acting on a particle; Application of graphical methods for the equilibrium of forces; free body diagram.
3. Centre of Gravity – Concept and definition of CG and centroid C.G. by moments; Centre of gravity of plane figures; C.G. of symmetrical solid bodies (No deduction of formula is necessary)
4. Friction
   1. Definition of friction, types of friction – static friction, dynamic friction, sliding friction, rolling friction with examples.
   2. Laws of friction – laws of static friction, co-efficient of friction, angle of friction.
   3. Equilibrium of a body lying on a rough horizontal plane; equilibrium of a body lying on a rough inclined plane; friction in screw jack; various mechanical devices which utilizes friction (belt & pulley drive, brake, vice etc.) Calculation of minimum force required to maintain equilibrium of a body on a rough inclined plane subjected to a force acting:
5. Along inclined plane
6. Horizontally
7. At some angle with the inclined plane
8. Simple Machines
   1. Definition of a machine; types of simple machine; Mechanical advantage; velocity ration; efficiency; relation between efficiency, mechanical advantage and velocity ratio; frictional loss; law of machine.
   2. System of pulleys – First system, second system and third system of pulleys.
   3. Working principle and applications of machines – wheel, axle, differential pulley; simple screw jack, Worm and warm wheel.
9. Rectilinear Motion
   1. Motion under uniform acceleration (); simple problems
   2. D’Alembert’s principle – application in single and connected bodies on horizontal plane, inclined plane and pulley system (with and without friction)
10. Curvilinear Motion
    1. Definitions – Projectile, trajectory, angle of projection, range, time of flight.
    2. Equation for the path of a projectile; velocity and direction of motion of a projectile after a given time has elapsed. Velocity and direction of motion of a projectile at a given height; Greatest height attained by a projectile and the time to reach the greatest height.
    3. Motion of Rotation – Angular displacement; Angular velocity; angular acceleration; relation between angular velocity and linear velocity in circular motion.

Centrifugal and centripetal force in circular motion.

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