GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/ME (Sandwich Pattern)**
Course Title : **Engineering Chemistry**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define i) Atom ii) Molecule. **[CO-1, L-R]**
b. State any two factors affecting degree of ionization. **[CO-2, L-U]**
c. Among the following compounds identity which will conduct electricity i) Ethyl alcohol ii) aq.KOH iii) aq.Nacl. **[CO-2, L-U]**
d. Explain the disadvantages of using hard water in textile industry. **[CO-3, L-U]**
e. Distinguish between scales and sludges (any two points). **[CO-3, L-U]**
f. Name the different types of oxide films formed by the action of oxygen on different metals. **[CO-4, L-R]**
g. Classify the different lubricants into its types i) Wax ii) Mineral oil. **[CO-5, L-A]**
h. Identify the type of lubrication for the following i) Sewing machine ii) I.C engine. **[CO-5, L-A]**
i. Define elasticity and lack property of rubber. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Distinguish between atomic number & atomic mass number (any four points). **[CO-1, L-U]**
b. Calculate the pH of the solutions having hydrogen ion concentration i) 1×10^{-5}gm ions/liter. ii) 1×10^{-9}gm ions/liter predict the nature of the solutions. **[CO-3, L-A]**
c. Write the role of following components of paints i) Pigments ii) Thinners iii) Drying oil iv) Driers. **[CO-4, L-A]**
d. Explain fluid film lubrication in detail. **[CO-5, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Write the electronic configurations of the following i) ${}^{14}_{7}N$ ii) ${}^{25}_{12}Mg$ iii) ${}^{19}_{10}Ne$ iv) ${}^{39}_{18}Ar$. **[CO-1, L-A]**
b. State Faraday's first law of electrolysis with its mathematical expression. **[CO-2, L-R]**
c. Distinguish between galvanizing and tinning (any four points). **[CO-4, L-U]**

d. State the bad effect of using hard water in boilers. **[CO-3, L-R]**

Q. 4 Attempt any FOUR **12 Marks**

a. State any three postulates of Bohr's theory. **[CO-1, L-R]**

b. Define hardness of water and name the substance causing hardness of water. **[CO-3, L-R]**

c. Give reason – Impure metal corrodes faster than pure metal under identical conditions. **[CO-4, L-A]**

d. Distinguish between thermoplastics and thermosetting plastics (any 3 points). **[CO-5, L-U]**

e. Explain vulcanization of rubber. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. i) Name any two processes involving electrolysis.
ii) Calculate the weight of copper deposited if 2 amperes current is passed through a solution of $CuSO_4$ for 10 minutes. (ECE of Cu=0.000329gm/couloumb). **[CO-2, L-A]**

b. Define – i) Viscosity index ii) Fire point iii) Flash points of lubricants. **[CO-5, L-R]**

c. Describe addition polymerization & condensation polymerization. **[CO-5, L-A]**

****End****

EVEN 2025-26

SC19103/SC19R103

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : CO/IF
Course Title : Applied Physics

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define fundamental and Derived unit. **[CO-1, L-A]**
b. Derive v = rw. **[CO-2, L-U]**
c. State the equation between electric field intensity and electric flux density with usual meanings of symbols. **[CO-3, L-U]**
d. State Ohm's law. **[CO-3, L-R]**
e. Define electric current and write its SI unit. **[CO-3, L-R]**
f. On what factors the resistance of the conductor depends? **[CO-3, L-U]**
g. Define S.H.M. and state its two examples. **[CO-2, L-R]**
h. State Snell's law. **[CO-4, L-R]**
i. The mass of Object is 37.2 ± 0.02 gm. Find the percentage error in this measurement. **[CO-1, L-A]**

Q.2 Attempt any THREE **12 Marks**

a. Define error. Explain types of errors. **[CO-1, L-U]**
b. Distinguish between Centripetal and Centrifugal force. **[CO-2, L-U]**
c. State and explain Coulomb's law of electrostatics. **[CO-3, L-U]**
d. A train crosses a tunnel in 20 sec. At the entry of the tunnel velocity is 72 km/hr. Find the length of the tunnel. **[CO-2, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Derive an expression for the resultant resistance, when three resistances are connected in parallel. **[CO-3, L-U]**
b. State four properties of magnetic lines of force. **[CO-3, L-R]**
c. Derive Prism formula. **[CO-4, L-U]**
d. Two point charges of 16 μC and 64 μC are placed 3 m part. Find the position of a point in between them where intensity due to two charges will be equal. **[CO-3, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Write the requirements of a good unit. **[CO-1, L-R]**

b. Derive the unit for specific resistance of a conductor in SI system. **[CO-3, L-R]**

c. State Laplace's law and Fleming's Left Hand Rule. **[CO-3, L-R]**

d. Draw a neat labeled diagram of Optical Fiber. **[CO-4, L-U]**

e. The angle of minimum deviation for an equilateral prism is 42^{o}. Find refractive index of the equilateral prism. **[CO-4, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. i) In case of Uniform Circular motion, if the radius vector subtends an angle of $\pi/3$ radian in 3 seconds. Calculate the angular velocity. **[CO-2, L-A]**

ii) Obtain the balancing condition of Wheatstone's network. **[CO-3, L-U]**

b. i) Write two properties of electric lines of force. **[CO-3, L-R]**

ii) A wire of 90 cm lies perpendicular to the uniform magnetic field. If the current of 10 A passes through the wire and a force of 0.6 N found to exist on a wire. Calculate the magnetic induction. **[CO-3, L-A]**

c. i) State the significance of Refractive Index. **[CO-4, L-A]**

ii) State four application of Official Fiber. **[CO-4, L-A]**

****End****

EVEN 2025-26 **SC19101/ SC19R101**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **IS/EE Engineering (Sandwich Pattern)**
Course Title : **Basic Physics**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define: i) Unit ii) Derived Physical quantity **[CO-1, L-R]**
b. Derive relation between linear velocity and angular velocity. **[CO-2, L-R]**
c. Define: i) Refraction of light ii) Infrasonic Waves. **[CO-3, L-R]**
d. Write two applications of Ultrasonic Waves. **[CO-3, L-A]**
e. Define: i) Nanometer ii) Nano Technology. **[CO-3, L-U]**
f. State Full form of LASER. **[CO-3, L-R]**
g. Mention four examples of fundamental Physical Quantity. **[CO-1, L-U]**
h. A vehicle starting from rest attains the acceleration of 60 cm/s^2 in 15 sec. Determine final velocity of vehicle. **[CO-2, L-A]**
i. Define: i) Nanoscale ii) Nanoparticles. **[CO-3, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. Distinguish between Centripetal force and Centrifugal force. **[CO-2, L-U]**
b. Write four characteristics of Photoelectric effect. **[CO-3, L-A]**
c. Write four properties of Ultrasonic Waves. **[CO-3, L-U]**
d. A weight exerts force of 120 N on steel wire of cross section area 0.02 cm^2, find extension produced if length of wire is 5 m and Young's modulus = 2×10^{13} N/m^2. **[CO-4, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Write four properties of LASER. **[CO-3, L-A]**
b. Write difference between Streamline flow and turbulent flow. **[CO-4, L-U]**
c. State two applications of nanotechnology each in i) Medical field and ii) Electronics. **[CO-3, L-A]**
d. For an equilateral prism, the angle of minimum deviation is 30^0. Find refractive index of prism and angle of incidence. **[CO-3, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Write three requirements of a good unit. **[CO-1, L-U]**
b. Write three applications of LASER. **[CO-3, L-A]**
c. Define nanostructured materials. Give four examples of it. **[CO-3, L-U]**
d. Define: i) Yong's modulus ii) Bulk modulus iii) Modulus of rigidity. **[CO-4, L-R]**

e. The Photoelectric work function of material is 3×10^{-19} J. Calculate it's threshold frequency Planck's constant is 6.625×10^{-34} Js. **[CO-3, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. i) State Hooke's law of Elasticity. **[CO-4, L-R]**

ii) Write four applications of Viscosity. **[CO-4, L-A]**

b. i) Define 1) Frequency 2) Wavelengths. **[CO-2, L-R]**

ii) A minute hand of a wall clock is 10 cm long. Calculate linear velocity of tip of minute hand. **[CO-2, L-A]**

c. i) State Snell's law. **[CO-3, L-R]**

ii) Which of the following is more accurate reading and why?

1) 1.75 ± 0.012 cm 2) 0.75 ± 0.007 cm. **[CO-1 L-A]**

****End****

EVEN 2025-26

SC19R102/SC19102

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/ME Engineering(Sandwich Pattern)**
Course Title : **Engineering Physics**

2:30 Hours/ 60 marks Enrolment No. | | | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Classify the followings into fundamental and derived unit. Kilogram, second, joule, watt. **[CO-1, L-U]**
b. State three equations of linear motion with usual meanings of symbols. **[CO-2, L-R]**
c. Define : (i) Time period (ii) Frequency. **[CO-2, L-R]**
d. Define velocity gradient. And write its SI unit. **[CO-3, L-R]**
e. Define : (i) Deforming force (ii) Restoring force. **[CO-3, L-R]**
f. Derive $V = \eta\lambda$. **[CO-4, L-U]**
g. Diameter of the wire measured by micrometer screw gauge is 0.345cm. If the least count (L.C.) of micrometer screw gauge is 0.001cm, calculate percentage error **[CO-1, L-A]**
h. State the full form of LASER. **[CO-5, L-R]**
i. Define Echo and reverberation. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Define unit. Write the requirements of a good unit. **[CO-1, L-R]**
b. Write four applications of Newton's first law of motion. **[CO-2, L-A]**
c. Distinguish between streamline and turbulent flow. **[CO-2, L-A]**
d. A capillary tube of diameter 1mm is dipped in water. How far will water rise in the tube if surface tension of water is 7×10^{-2} N/m. **[CO-3, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Distinguish between longitudinal and transverse waves. **[CO-4, L-U]**
b. State and explain the factors affecting acoustics of sound. **[CO-4, L-U]**
c. Write four applications of optical fiber. **[CO-5, L-A]**
d. Refractive index of prism is 1.5 and its angle is 60^0. Find the angle of minimum deviation. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Write three properties of LASER. **[CO-5, L-R]**
b. Draw a neat labeled diagram of total internal reflection. **[CO-5, L-U]**
c. Define adhesive and cohesive force with an example of each. **[CO-3, L-R]**
d. Write Sabines's formula for reverberation time with usual meanings of symbols. **[CO-4, L-U]**
e. Write significance of Reynold's number. **[CO-3, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. (i) Derive the relation between linear velocity and angular velocity. **[CO-2, L-U]**

(ii) A bullet of mass 70gm is fired with a muzzle velocity of 300 m/s from a gun of mass 7kg. Calculate the recoil velocity of a gun. **[CO-2, L-A]**

b. (i) State Hooke's law of elasticity. **[CO-3, L-R]**

(ii) A spherical ball of radius 2.2mm and density 8X 10^3kg/m^3 falls througha liquid of density 1.3 X 10^3kg/m^3. Find terminal velocity. (Given : η for liquid = 0.45Ns/m^2). **[CO-3, L-A]**

c. (i) State Snell's law. **[CO-5, L-R]**

(ii) Write applications of LASER. **[CO-5, L-A]**

****End****

EVEN 2025-26 **SC23105**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/ME/RT**
Course Title : **Engineering Chemistry**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. List the names of orbital & its maximum electron capacity. **[CO-1, L-R]**
b. Define electrolytes & mention its types. **[CO-2, L-R]**
c. Define concentration of ore. **[CO-4, L-R]**
d. Define coagulation. **[CO-3, L-R]**
e. List the types of impurities present in natural water. **[CO-3, L-R]**
f. Define dry corrosion. **[CO-2, L-R]**
g. Define ignition temperature of fuel. **[CO-5, L-R]**
h. Define alloy and give one example of alloy. **[CO-4, L-R]**
i. Nam any two examples of liquid and gaseous fuels. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain Bohr's Atomic theory. **[CO-1, L-U]**
b. Distinguish between temporary hardness & permanent hardness of water **[CO-3, L-A]**
c. Explain ferrous alloys & their classification based on carbon content. **[CO-4, L-U]**
d. Explain proximate analysis of coal. **[CO-5, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe formation of chlorine molecule with suitable orbit diagram. **[CO-1, L-A]**
b. Describe Faraday's first law of electrolysis & derive its mathematical expression. **[CO-2, L-U]**
c. Describe sterilization of water using chlorine water and bleaching powder. **[CO-3, L-A]**
d. Explain any four purposes of making alloy. **[CO-4, L-U]**

EVEN 2025-26

Q. 4 Attempt any FOUR **12 Marks**

a. Explain degree of dissociation & factors affecting it. **[CO-2, L-U]**

b. Calculate atomic number and atomic mass number of an element which contains 15 protons, 16 neutrons & 15 electrons. **[CO-1, L-A]**

c. Explain BOD of water. **[CO-3, L-U]**

d. Explain bad effects of using hard water in boiler. **[CO-3, L-U]**

e. Explain the role of gypsum in cement. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. 1) Describe hardening & setting of cement. **[CO-4, L-A]**

2) Explain non-ferrous alloys with example **[CO-4, L-U]**

b. Describe fractional distillation of crude oil with suitable diagram. **[CO-5, L-A]**

c. 1) Describe direct corrosion and its mechanism. **[CO-2, L-A]**

2) When current of 0.2 amperes passed through $CuSO_4$ solution for 1 hr. deposits 0.2936 g of copper. Find electrochemical equivalent weigh of copper. **[CO-2, L-A]**

****End****

EVEN 2025-26 SC19106 /SC19R106

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **IS/EE (Sandwich Pattern)**
Course Title : **Applied Chemistry**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. List the name of orbitals and its maximum electron capacity. **[CO-1, L-R]**
b. Define electrolyte & list their types. **[CO-2, L-R]**
c. Define electrolytic conductor. **[CO-2, L-R]**
d. State Ohm's law. **[CO-2, L-R]**
e. Define electrochemical cell. **[CO-2, L-R]**
f. Define corrosion. Name its type. **[CO-3, L-R]**
g. Define viscocity. **[CO-3, L-R]**
h. List any two properties of metals. **[CO-4, L-R]**
i. List any two function of lubricants. **[CO-4, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain modern atomic structure. **[CO-1, L-U]**
b. Describe electrolysis of copper sulphate solution using active electrode. **[CO-2, L-A]**
c. Describe Faradays first law of an electrolysis with its mathematical expression. **[CO-2, L-A]**
d. Explain construction of lead acid storage cell with suitable diagram. **[CO-2, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe formation of NaCl molecule with suitable orbit diagram. **[CO-1, L-A]**
b. Explain degree of ionization & named the factors affecting it. **[CO-2, L-U]**
c. Explain working of lithium-ion battery. **[CO-2, L-U]**
d. Explain non-porous oxide film in corrosion is also known as protective film. **[CO-3, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain Hund's rule with suitable example. **[CO-1, L-U]**
b. Write down any three applications of lithium-ion battery. **[CO-2, L-A]**
c. Explain flash paint and fire point of lubricant. **[CO-3, L-U]**
d. Explain chemical composition of duralumin & its two uses. **[CO-4, L-U]**
e. Explain alloys & mention any two purposes for preparation of alloys. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. i) Mention condition under which semi-solid lubricant is used. **[CO-4, L-U]**
   ii) Describe fluid film lubrication process. **[CO-4, L-A]**
b. Describe addition polymerization and condensation polymerization with suitable example. **[CO-4, L-A]**
c. i) Classify corrosion based on metal oxide layer formed. **[CO-3, L-U]**
d. ii) Explain tinning process. **[CO-3, L-A]**

****End****

EVEN 2025-26

SC19110/SC19R110

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/CO/EC/IS/ME/IF/EE (Sandwich Pattern)**
Course Title : **Engineering Mathematics**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. If $f(x) = x^2 + \sqrt{x} + 1$, find f (1) and f (4). **[CO-1, L-A]**

b. *Evaluate* : $\lim_{x \to 1} \left[\frac{x^6-1}{x-1}\right]$ **[CO-1, L-U]**

c. Find $\frac{dy}{dx}$, if $y = sinx + tanx$. **[CO-2, L-R]**

d. Find $\frac{dy}{dx}$, if $y = log\,(sinx)$. **[CO-2, L-R]**

e. *Evaluate* : $\int \left(\frac{1}{1+x^2} - \frac{cosx}{sin^2x}\right) dx$. **[CO-3, L-U]**

f. *Evaluate* : $\int \frac{1}{4-x^2}\, dx$. **[CO-3, L-A]**

g. Simplify : $1 + i^{100} + i^{10} + i^{50}$. **[CO-2, L-U]**

h. If $Z = 1 + \sqrt{3}i$, *show that* $Z^2 + 4 = 2Z$. **[CO-2, L-U]**

i. Using Bisection method, find an approximate roots of the equation $x^3 - 2x - 5 = 0$ (only one iterations) **[CO-2, L-A]**

Q.2 Attempt any THREE **12 Marks**

a. If $f(x) = \frac{x+5}{3x-4}$ and $t = \frac{5+4x}{3x-1}$ show that $f(t) = x$. **[CO-1, L-U]**

b. *Evaluate* : $\lim_{x \to -2} \left[\frac{x^2-2x-8}{x^2+6x+8}\right]$ **[CO-1, L-A]**

c. *Find* $\frac{dy}{dx}$, *if* $y = cos(x.e^x)$. **[CO-2, L-U]**

d. Express $\frac{2-3i}{1+2i}$ in the form $x + iy$. [CO-2, L-R]

Q. 3 Attempt any THREE **12 Marks**

a. If $f(x) = log\left(\frac{x}{x-1}\right)$, show that $f(a+1) + f(a) = log\left(\frac{a+1}{a-1}\right)$. [CO-1, L-A]

b. *Evaluate :* $\lim_{x \to 0}\left[\frac{xcosx+sinx}{x^2+tanx}\right]$ [CO-1, L-A]

c. *Evaluate :* $\int_2^5 \frac{\sqrt{x}}{\sqrt{7-x}+\sqrt{x}}\, dx.$ [CO-3, L-U]

d. Using False position method. Find the approximate value of $\sqrt{6}$ by performing two iterations. [CO-2, L-A]

Q. 4 Attempt any FOUR **12 Marks**

a. If $f(x) = logx$ & $g(x) = x^3$ then find $fog(x)$& $go\, f(x)$. [CO-1, L-R]

b. *Evaluate :* $\lim_{x \to 0}\left[\frac{sinax}{sinbx}\right]$ [CO-1, L-U]

c. *Evaluate :* $\int \frac{(sin^{-1}x)^2}{\sqrt{1-x^2}}\, dx.$ [CO-3, L-A]

d. Find area of region bounded by the curve $y = 4x^2, x - axis$ & the line $x = 1$ & $x = 2$. [CO-3, L-A]

e. Solve the following equation by Gauss-elimination method. [CO-2, L-A]

$x + y + z = 4$
$2x + y + z = 5$
$3x + 2y + z = 7$

Q. 5 Attempt any TWO **12 Marks**

a. If $y = sin^{-1}x$, then prove that $(1 - x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} = 0.$ [CO-2, L-A]

b. Express $Z = \frac{-1}{2} + \frac{\sqrt{3}}{2}i$ in polar form. [CO-2, L-U]

c. Solve the following equations by Gauss-Seidal method (Perform 3 iterations).

$x + 7y - 3z = 22$
$5x - 2y + 3z = 18$
$2x - y + 6z = 22$ [CO-2, L-A]

****End****

EVEN 2025-26 **HU23501**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/CO/EC/IS/ME/RT/IF/LG/LT/EE/AIML (Sandwich Pattern)**
Course Title : **Communication Skills/Business Communication**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Mention the details to be included in order letter. **[CO-5, L-R]**
b. List the different elements in communication cycle. **[CO-1, L-R]**
c. Define Descriptive paragraph with example. **[CO-2, L-R]**
d. State concept of panel interview. **[CO-3, L-R]**
e. State the meaning of downward communication with one example. **[CO-1, L-R]**
f. Write uses of Power Point presentation. **[CO-4, L-R]**
g. Write the major steps of Dialogue writing. **[CO-2, L-R]**
h. Define circular. **[CO-5, L-R]**
i. Define Non-verbal communication. **[CO-1, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain preparation for an interview. **[CO-3, L-U]**
b. Develop dialogue between teacher and student about admission process and write it correctly. **[CO-2, L-A]**
c. Explain Grapevine communication with example. **[CO-1, L-U]**
d. Explain importance of Gestures during presentation. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Write short note on Linguistic barriers with examples. **[CO-1, L-U]**
b. Develop a paragraph on 'My favourite place to visit'. **[CO-2, L-A]**
c. Draft a notice for students regarding the "Book Exhibition" being organized by the students committee of your polytechnic. **[CO-5, L-A]**
d. A student continuously remains absent for the lectures. As a HOD of your department draft a memo to give warning to the students. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. State the need of communication. **[CO-1, L-U]**
b. Write short note on factual topics group discussion. **[CO-3, L-U]**
c. State details necessary to write an accident report. **[CO-5, L-R]**
d. List different parts of resume. **[CO-5, L-R]**
e. Explain the meaning of Barriers to Communication. How you will overcome physical barriers? **[CO-1, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. Write about dress code & grooming of men and women in interview. **[CO-3, L-U]**

b. Write in detail tips for Effective Presentation. **[CO-4, L-R]**

c. As a librarian of your institute place an order letter with Aakash Book Suppliers, Sadashiv Peth, Pune for the books which you require for library. **[CO-5, L-A]**

****END****

EVEN 2025-26 **SC23105**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/ME/RT**
Course Title : **Engineering Chemistry**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. List the names of orbital & its maximum electron capacity. **[CO-1, L-R]**
b. Define electrolytes & mention its types. **[CO-2, L-R]**
c. Define concentration of ore. **[CO-4, L-R]**
d. Define coagulation. **[CO-3, L-R]**
e. List the types of impurities present in natural water. **[CO-3, L-R]**
f. Define dry corrosion. **[CO-2, L-R]**
g. Define ignition temperature of fuel. **[CO-5, L-R]**
h. Define alloy and give one example of alloy. **[CO-4, L-R]**
i. Nam any two examples of liquid and gaseous fuels. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain Bohr's Atomic theory. **[CO-1, L-U]**
b. Distinguish between temporary hardness & permanent hardness of water **[CO-3, L-A]**
c. Explain ferrous alloys & their classification based on carbon content. **[CO-4, L-U]**
d. Explain proximate analysis of coal. **[CO-5, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Describe formation of chlorine molecule with suitable orbit diagram. **[CO-1, L-A]**
b. Describe Faraday's first law of electrolysis & derive its mathematical expression. **[CO-2, L-U]**
c. Describe sterilization of water using chlorine water and bleaching powder. **[CO-3, L-A]**
d. Explain any four purposes of making alloy. **[CO-4, L-U]**

EVEN 2025-26

Q. 4 Attempt any FOUR **12 Marks**

a. Explain degree of dissociation & factors affecting it. **[CO-2, L-U]**

b. Calculate atomic number and atomic mass number of an element which contains 15 protons, 16 neutrons & 15 electrons. **[CO-1, L-A]**

c. Explain BOD of water. **[CO-3, L-U]**

d. Explain bad effects of using hard water in boiler. **[CO-3, L-U]**

e. Explain the role of gypsum in cement. **[CO-4, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. 1) Describe hardening & setting of cement. **[CO-4, L-A]**

2) Explain non-ferrous alloys with example **[CO-4, L-U]**

b. Describe fractional distillation of crude oil with suitable diagram. **[CO-5, L-A]**

c. 1) Describe direct corrosion and its mechanism. **[CO-2, L-A]**

2) When current of 0.2 amperes passed through $CuSO_4$ solution for 1 hr. deposits 0.2936 g of copper. Find electrochemical equivalent weigh of copper. **[CO-2, L-A]**

****End****

EVEN 2025-26 **SC23101**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **EC/IS/EE (Sandwich Pattern)**
Course Title : **Basic Physics**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define fundamental and derived quantity. **[CO-1, L-R]**
b. Define periodic motion with examples. **[CO-2, L-R]**
c. Derive the relation between linear velocity and angular velocity. **[CO-2, L-U]**
d. Write Einestein's photoelectric equation with meanings of symbols of its. **[CO-3, L-U]**
e. State laws of retraction of light. **[CO-4, L-R]**
f. Define coefficient of viscosity and state its SI unit. **[CO-5, L-R]**
g. State a full form of LASER. **[CO-3, L-U]**
h. State Hooke's law of elasticity. **[CO-5, L-R]**
i. State the number of significant figures in the following measurements i) 0.0025 ii) 0.0250 iii) 0.002500 iv) 5.98×10^{24}. **[CO-1, L-A]**

Q.2 Attempt any THREE **12 Marks**

a. Write the difference between scalar and vector quantity. **[CO-1, L-U]**
b. Distinguish between centripetal and centrifugal force. **[CO-2, L-U]**
c. Write four characteristics of photoelectric effect. **[CO-3, L-R]**
d. A train crosses a tunnel in 20sec. At the entry of the tunnel velocity is 72km/hr and at the exit of the tunnel velocity is 36km/hr. Find the length of the tunnel. **[CO-2, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. State the properties of LASER. **[CO-3, L-R]**
b. Define Young's modulus, bulk modulus and rigidity modulus of elasticity and state the relation among them. **[CO-5, L-R]**
c. Drive prism formula. **[CO-4, L-U]**
d. A wire of diameter 3mm and length 4m extends by 2.5mm when a force of 10N is applied. Find the Young's modulus of material of wire. **[CO-4, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Write the significance of Reynold's number. **[CO-5, L-A]**
b. Draw a energy level diagram for conductor, insulator and semi conductor. **[CO-3, L-U]**

c. Draw a stress-strain curve. **[CO-5, L-U]**

d. Write the difference between optical fiber cable and electric cable wire. **[CO-4, L-U]**

e. For an equilateral prism, angle of incidence is 40°. Find angle of minimum deviation. **[CO-4, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. i) Write two applications of LASER. **[CO-3, L-A]**

ii) The diameter of rod is measured with micrometer screw gauge for three times as 1.223cm, 1.224cm and 1.224cm. Calculate the percentage error in measuring diameter if zero error is +0.002cm. **[CO-1, L-A]**

b. i) State three equations of motion.. **[CO-2, L-R]**

ii) State and explain Newton's second law of motion. **[CO-2, L-R]**

c. i) The energy of photon is 5.28×10^{-19}J. Calculate frequency (Given = C=3×10^{8}m/s and H = 6.625×10^{-34}JS). **[CO-3, L-A]**

ii) Explain Recoil of a gun. **[CO-2, L-U]**

****End****

EVEN 2025-26 **SC23106**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Rubber Technology (Sandwich Pattern)**
Course Title : **Basics of Organic Chemistry**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define valency of an atom. **[CO-1, L-R]**
b. Define organic chemistry. **[CO-1, L-R]**
c. Name any two olefin compounds. **[CO-2, L-R]**
d. Define alkane & list its general formula. **[CO-2, L-R]**
e. Define amines. **[CO-3, L-R]**
f. List any two properties of alcohol. **[CO-3, L-R]**
g. Define fatty acids. **[CO-4, L-R]**
h. Named monomer used in synthesis of polyvinyl chloride & polyethylene. **[CO-5, L-R]**
i. Define polymer. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Explain molecular formula and empirical formula. **[CO-1, L-U]**
b. Write IUPAC name of following structures $CH_2 = CH2$, $CH_2 = CH\text{-}CH_3$, $CH_2\text{-}CH = CH\ CH_2$, $CH_2 = CH\text{-}CH = CH_2$. **[CO-2, L-U]**
c. Classify alcohols based on their structure. **[CO-3, L-U]**
d. Write the general properties of fatty acids. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Calculate the valency of carbon in methane & valency of nitrogen in ammonia molecule. **[CO-1, L-A]**
b. Draw the chemical structure of isoprene and chloroprene unit & with its IUPAC name. **[CO-2, L-A]**
c. Classify the following as primary, secondary & tertiary amine. $CH_3\text{-}NH_2$, $CH_3\text{-}CH_2\text{-}NH_2$, $CH_3\text{-}NH\text{-}CH_3$, $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{N}}} - CH_3$ **[CO-3, L-U]**
d. Classify polymer based on their source of origin. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain aromatic compound with suitable example. **[CO-1, L-U]**
b. Explain heterocyclic compound with suitable example. **[CO-1, L-U]**
c. Explain homologous series of alkane from C_1 to C_4 carbon atom. **[CO-2, L-U]**
d. Mention any three properties of olefin. **[CO-2, L-U]**
e. Enlist any three application of esters in rubber industry. **[CO-4, L-R]**

Q. 5 Attempt any TWO **12 Marks**

a. i) Describe classification of amine with example. **[CO-3, L-A]**
ii) Describe application of amine in rubber industry. **[CO-3, L-A]**
b. Explain saponification process in details. **[CO-4, L-A]**
c. Explain addition polymerization & condensation polymerization with suitable example. **[CO-5, L-A]**

****End****

EVEN 2025-26 **SC23109**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **Instrumentation Engineering (E & C) (Sandwich Pattern)**
Course Title : **Analytical Chemistry**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define valency. **[CO-1, L-R]**
b. Define electro chemistry. **[CO-2, L-R]**
c. Define anode and cathode. **[CO-2, L-R]**
d. Define dry corrosion. **[CO-4, L-R]**
e. Define spectroscopy. **[CO-3, L-R]**
f. State relationship between wavelength and frequency. **[CO-3, L-R]**
g. List any four factors affecting the rate of corrosion. **[CO-4, L-R]**
h. Enlist any two non-ferrous alloys. **[CO-5, L-R]**
i. Define malleability & ductility. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Describe modern atomic structure. **[CO-1, L-A]**
b. Explain electrolysis of aqueous $CuSO_4$ solution using inert electrode with suitable diagram. **[CO-2, L-U]**
c. Explain electromagnetic spectrum & its various region. **[CO-3, L-U]**
d. Classify the corrosion based on different metal oxide layer formed. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain atomic number and atomic mass number. Calculate atomic number & atomic mass number of an element which contains 13 protons, 14 neutrons and 13 electrons. **[CO-1, L-U]**
b. Describe galvanization process. **[CO-4, L-A]**
c. During electrolysis of $CuSO_4$ solution, 0.19789 of Cu were deposited by a current of 0.2 ampere in 60 minutes. Calculate the electrochemical equivalent weight (ECE) of copper. **[CO-2, L-A]**
d. Explain alloys and list any four purposes of making alloys. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain ionic bond with suitable example. **[CO-1, L-U]**
b. Describe degree of dissociation and list factors affecting it. **[CO-2, L-A]**
c. Explain Faraday's second law of electrolysis with its mathematical expression. **[CO-2, L-U]**
d. Classify steel based on percentage of carbon content. **[CO-5, L-U]**
e. State Beer-Lamberts law with mathematical equation. **[CO-3, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. (i) The wavelength of light is 480nm. Calculate its frequency and wave number. (Given velocity of light $C = 3\ X\ 10^8 m/s$). **[CO-3, L-A]**

(ii) Describe different kinds of energies present in molecule. **[CO-3, L-A]**

b. (i) Describe concentration cell corrosion. **[CO-4, L-A]**

(ii) Explain sacrificial anodic method for corrosion control. **[CO-4, L-U]**

c. Describe chemical composition and application of brass, bronze and duralumin. **[CO-5, L-A]**

****End****

EVEN 2025-26 **SC23108**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : Electrical Engineering (Sandwich Pattern)
Course Title : Applied Chemistry

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define atomic number. **[CO-1, L-R]**
b. Define electro chemistry. **[CO-2, L-R]**
c. Define conductor. **[CO-3, L-R]**
d. Define electrolytic cell. **[CO-3, L-R]**
e. Define electrochemical corrosion. **[CO-4, L-R]**
f. Enlist any four factors affecting rate of corrosion. **[CO-4, L-R]**
g. Define cation and anion. **[CO-2, L-R]**
h. Name the monomer used in synthesis of polyethylene & poly tetra fluoro ethylene. **[CO-5, L-R]**
i. List any four properties of metal. **[CO-5, L-R]**

Q.2 Attempt any THREE **12 Marks**

a. Describe formation of MgO molecule with suitable orbit diagram. **[CO-1, L-A]**
b. When a current of 5 ampere passed through silver nitrate solution for 50 minutes deposit 6.0gm of silver. Calculate electrochemical equivalent weight of Ag. **[CO-2, L-A]**
c. Explain construction of dry cell with suitable diagram. **[CO-3, L-U]**
d. Explain mechanism of dry corrosion. **[CO-4, L-U]**

Q. 3 Attempt any THREE **12 Marks**

a. Explain modern atomic theory. **[CO-1, L-U]**
b. Describe the types of corrosion in details. **[CO-4, L-A]**
c. Explain electrolysis of copper Sulphate using inert electrode. **[CO-2, L-U]**
d. Explain condensation polymerization with suitable example. **[CO-5, L-U]**

Q. 4 Attempt any FOUR **12 Marks**

a. Explain covalent bond with example. **[CO-1, L-U]**
b. Describe synthesis of polystyrene. **[CO-5, L-A]**
c. Explain Faraday's first law of an electrolysis with its mathematical expression. **[CO-2, L-U]**
d. Explain degree of dissociation & list factors affecting it. **[CO-3, L-U]**
e. Explain vulcanization of rubber. **[CO-5, L-U]**

Q. 5 Attempt any TWO **12 Marks**

a. i) Distinguish between primary cell & secondary cell. **[CO-3, L-A]**
ii) Explain open circuit with diagram. **[CO-3, L-U]**

b. i) Explain galvanization process. **[CO-4, L-U]**
ii) Explain non-porous metal oxide layer which is known as protective film. **[CO-4, L-U]**

c. Describe preparation of alloys with any one method. **[CO-5, L-A]**

****End****

EVEN 2025-26

SC23102

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/ME/RT Engineering(Sandwich Pattern)**
Course Title : **Engineering Physics**

2:30 Hours/ 60 marks Enrolment No. | | | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define fundamental physical quantity. Write two examples of it. **[CO-1, L-R]**
b. State two requirements of a good unit. **[CO-1, L-R]**
c. Derive the relation between linear velocity and angular velocity. **[CO-3, L-R]**
d. Define : (i) Elasticity (ii) Plasticity. **[CO-3, L-R]**
e. Explain the significance of Reynold's number. **[CO-3, L-U]**
f. Define resonance. Write two examples of it. **[CO-4, L-R]**
g. Write two characteristics of longitudinal waves. **[CO-4, L-U]**
h. State Snell's law. **[CO-5, L-R]**
i. Mention two physical properties of nanomaterial. **[CO-5, L-U]**

Q.2 Attempt any THREE **12 Marks**

a. Define error. Explain different types of errors. **[CO-1, L-U]**
b. State any four characteristics of transverse waves. **[CO-4, L-U]**
c. State four applications of centripetal force. **[CO-2, L-A]**
d. Refractive index of an equilateral prism is 1.5 Find angle of minimum deviation. **[CO-5, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Distinguish between centripetal force and centrifugal force. **[CO-2, L-U]**
b. Explain Laplace's molecular theory of surface tension. **[CO-3, L-U]**
c. Write the difference between optical fiber and electrical cable. **[CO-5, L-U]**
d. A spherical steel ball of diameter 6 mm and density 7.2×10^3 kg/m^3 falls with terminal velocity of 0.24 m/s through glycerin. Find the coefficient of viscosity of glycerin.(Given density of glycerin = 1.26×10^3 kg/m^3) **[CO3-, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Define i) S.H.M. ii) Frequency iii) Wavelength. **[CO-2, L-R]**
b. State Newton's law of viscosity. Hence define coefficient of viscosity. **[CO-3, L-A]**
c. State significance of angle of contact. **[CO-3, L-A]**

d. A tuning fork of frequency 480Hz resonates with an air column of length 16 cm. The end correction is 0.5 cm. Calculate the velocity of sound in air. **[CO-3, L-A]**

e. Which of the following is more accurate reading and why?
i) 1.22 ± 0.003 mm ii) 3.22 ± 0.004 mm. **[CO-1, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. i) State Newton's first law of motion. **[CO-2, L-R]**
ii) State four application of Newton's second law of motion. **[CO-2, L-R]**

b. i) Define : A) Nanoscale B) Nanometer. **[CO-5, L-R]**
ii) State four application of optical fiber cable. **[CO-5, L-R]**

c. i) Sate two conditions for Total Internal Reflection (T.I.R.). **[CO-5, L-R]**
ii) A weight exerts force of 100N on steel wire of cross-sectional area 0.02 cm^2 Find extension produced if the length of wire is 5m and $Y = 2x10^{11}$ N/m^2. **[CO-3, L-A]**

****End****

EVEN 2025-26 **SC23103**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CO/IF (Sandwich Pattern)**
Course Title : **Applied Physics**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | | |

Instructions:
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. Define : i) Derived quantity ii) Vector quantity. **[CO-1, L-R]**
b. Define : i) Wavelength ii) Amplitude. **[CO-2, L-R]**
c. State Coulomb's law of electrostatics. **[CO-3, L-R]**
d. Define specific resistance. Write SI unit of it. **[CO-4, L-R]**
e. State Laplace's law. **[CO-4, L-R]**
f. Derive relation between linear velocity and angular velocity. **[CO-2, L-U]**
g. Calculate intensity of electric field at a point 0.4m from a charge of $1.6\mu C$, when placed in air. **[CO-3, L-A]**
h. State Snell's law. **[CO-5, L-R]**
i. Find the number of significant figures of following : i) 320023 ii) 0.004800 iii) 3.200×10^{24} iv) 500.00. **[CO-1, L-A]**

Q.2 Attempt any THREE **12 Marks**

a. Define error. Explain types of errors. **[CO-1, L-U]**
b. Write any four properties of electric lines of force. **[CO-3, L-U]**
c. State following terms with one example of each i) Oscillatory motion ii) S.H.M. **[CO-2, L-U]**
d. A ball is thrown in space & caught at same height after 4sec. Calculate its final velocity at ground. **[CO-2, L-A]**

Q. 3 Attempt any THREE **12 Marks**

a. Derive an expression for equivalent resistance, when three resistances are connected in series. **[CO-4, L-U]**
b. Distinguish between optical fiber cable and electrical cable. **[CO-5, L-U]**
c. A circular coil is of 10 turns and radius 1cm. If a current of 5A flows through it. Calculate magnetic induction at its center, if medium is air (Given : $\mu_0=4\pi\times10^{-7}$ Wb/Am). **[CO-4, L-A]**
d. State applications of optical fiber (two of each) in i) Electronics field ii) Medical field. **[CO-5, L-A]**

Q. 4 Attempt any FOUR **12 Marks**

a. Write three requirements of a good unit. **[CO-1, L-U]**

b. State Newton's first law of motion. Mention two examples of it. **[CO-2, L-R]**

c. State three applications of centrifugal force. **[CO-2, L-A]**

d. State three properties of magnetic lines of force. **[CO-4, L-U]**

e. For an equilateral prism, the angle of minimum deviation is 35°. Find refractive index of prism. **[CO-5, L-A]**

Q. 5 Attempt any TWO **12 Marks**

a. i) Explain why potential of earth is assumed to be zero volt. **[CO-3, L-U]**
ii) Two charges of $33\mu C$ and $-55\,\mu C$ are placed 1.6m apart in air. Determine the position of point in between them where the resultant potential is zero. **[CO-3, L-A]**

b. i) Write equations of linear motion under gravity when body moves in downward direction. **[CO-2, L-U]**
ii)Derive prism formula. **[CO-5, L-U]**

c. i) State any two applications of Newton's second law of motion. **[CO-2, L-A]**
ii)Two resistances have effective resistance of 16Ω in series and 4Ω in parallel. Find value of each resistance. **[CO-4, L-A]**

****End****

EVEN 2025-26 **SC23502**

GOVERNMENT POLYTECHNIC MUMBAI
TERM END EXAMINATION

Programme : **CE/CO/EC/IS/ME/IF/EE/RT (Sandwich Pattern)**
Course Title : **Engineering Mathematics**

2:30 Hours / 60 marks Enrolment No. | | | | | | | | | |

***Instructions*:**
1. Attempt all the questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Use of Mathematical Tables, Steam Table and Pocket Calculator (non-programmable) is permissible.
4. Marks on Right Hand Side indicate full marks for the question.
5. Assume suitable additional data, if necessary
6. CO=COURSE OUTCOMES, L=LEVELS

Q.1 Attempt any SIX **12 Marks**

a. *Evaluate* : $\int \frac{1}{4x^2+9}\,dx$ **[CO-1, L-A]**

b. *Evaluate* : $\int x\,cosx\,dx$ **[CO-1, L-U]**

c. *Evaluate* : $\int_1^2 \frac{1}{3x-2}\,dx$ **[CO-2, L-A]**

d. *Evaluate* : $\int_0^1 xe^x dx$ **[CO-2, L-A]**

e. Find order and degree of DE $\sqrt[3]{\frac{d^2y}{dx^2}} = \sqrt{\frac{dy}{dx}}$ **[CO-3, L-R]**

f. Find integrating factor $e^{\int p dx}$ for $\frac{dy}{dx} + ytanx = sin2x$ **[CO-3, L-U]**

g. Show that roots of equation $x^3 - 9x + 1 = 0$ lies between 2 & 3. **[CO-4, L-A]**

h. Using Bisection method find approximate root of $x^3 - 6x + 3 = 0$ between 2 and 3 (carry out 1 iteration) **[CO-4, L-R]**

i. Fit Poisson's distribution for following sets : **[CO-5, L-A]**

x_i	20	30	40	50	60	70
f_i	8	12	30	10	6	4

Q.2 Attempt any THREE **12 Marks**

a. *Evaluate* : $\int \frac{(tan^{-1}x)^3}{1+x^2}\,dx$ **[CO-1, L-U]**

b. *Evaluate* : $\int_0^1 \sqrt{1-x^2}\;dx$ **[CO-2, L-A]**

c. Solve : $\frac{dy}{dx} = e^{3x-2y} + x^2e^{-2y}$ **[CO-3, L-U]**

d. Using trapezoidal rule, evaluate $\int_0^6 f(x)dx$ given by [CO-4, L-A]

x	0	1	2	3	4	5	6
f(x)	1	0.5	0.3333	0.25	0.2	0.6666	0.1428

Q. 3 Attempt any THREE **12 Marks**

a. Find the area under the curve $y = x^3$ *at* $x = -1$ *and* $x = 1$. [CO-2, L-A]

b. Solve : $(e^x + 2xy^2 + y^3)dx + (a^y + 2x^2y + 3xy^2)dy = 0$ [CO-3, L-A]

c. Solve by using Jacobi's method (Perform 3 iterations) [CO-4, L-A]

$20x + y - 2z = 17$
$3x + 20y - z = -18$
$2x - 3y + 20z = 25$

d. If 20% of bolts produced by machine are defective, determine the probability that out of 4 bolts drawn (i) One is defective (ii) Exactly 3 are defective. [CO-5, L-A]

Q. 4 Attempt any FOUR **12 Marks**

a. *Evaluate* : $\int \frac{1}{9sin^2x+4cos^2x}\,dx$ [CO-1, L-A]

b. *Evaluate* : $\int \frac{1}{x^2(x+1)}\,dx$ [CO-1, L-A]

c. *Evaluate* : $\int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{sinx}+\sqrt{cosx}}\,dx$ [CO-2, L-A]

d. If 2% of the electric bulbs manufactured by a company are defective. Find the probability that in a sample of 100 bulbs atleast two are defective. [CO-5, L-R]

e. A sample of 100 battery cells tested to find the length of life produced mean 12 Hr & S.D. is 3 Hr. Assuming data normally distributed what percentage of battery cells are expressed to have life more than 15 Hrs.
(given A(1) = 0.3413) [CO-5, L-U]

Q. 5 Attempt any TWO **12 Marks**

a. Find the area bounded between the parabola $y^2 = 9x$ *and* $x^2 = 9y$ [CO-2, L-A]

b. Solve : $(x+1)\frac{dy}{dx} - y = e^x(x+1)^2$ [CO-3, L-A]

c. *Evaluate* : $\int_0^6 \frac{1}{1+x^2}\,dx$ by using Simpson's $\frac{3}{8}$ th rule. [CO-4, L-A]

****END****