BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Engineering & Technology**

Subject: **Applied Chemistry (GC104)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All Questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. **Answer any five of the following Questions:** 5x3=15
- **a)** State Aufbau Principle. Write the values of principal quantum number (n) and Azimuthal quantum number(l) for 3p,4f,6d and 2S orbital.
- **b)** For principal quantum number 'n' = 4, write the possible values of Azimuthal quantum number (l) and magnetic quantum number(ml)
- **c)** What are the causes of hardness in water?
- **d)** Define the following terms: i)Electrolyte ii) Electrolysis iii)Degree of Ionization
- **e)** Write a note on corrosion due to gases.
- **f)** Give reasons for following: i)Part of nail inside wood corrodes ii)Why galvanized wares are not used for storing food stuff?
- **g)** State any three drawbacks of natural rubber.
- **h)** i)Which of the following metals can displace H_2 gas from acid solutions and why? Zn, Cu, Ag, Au?
  ii)Give two points of difference between temporary and permanent hardness of water.

Q.No.2. **Answer any three of the following Questions:** 3 x 4 = 12
- **a)** How covalent bond is formed? Explain the information of O_2 molecule by covalency.
- **b)** Give four points of difference between orbit and orbital.
- **c)** Define Quantum Numbers. Explain the significance of principal and Spin quantum numbers.
- **d)** State Octet rule. Write the orbital electronic configuration of Neon, Magnesium and Chlorine.

Q.No.3. **Answer any three of the following Questions:** 3 x 4 = 12
- **a)** What is desalination of brackish water? With the help of diagram, explain the process of electro-dialysis for desalination of brackish water.
- **b)** i) Define sludge and scale.
  ii)What are the disadvantages of sludge and scale formation in boilers?
- **c)** Define hard water. Explain the disadvantages of using hard water for domestic purpose.
- **d)** With reference to zeolite process of water softening:
  i)Write the formula of sodium zeolite.
  ii)Write one reaction each for removal of temporary and permanent hardness of water.
  iii)Write the reaction for regeneration of exhausted zeolite.

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Q.No.4. **Answer any three of the following Questions:** 3 x 4 = 12

a) State any four postulates of Arrhenius theory of electrolytic dissociation.

b) In the electrolysis of aqueous $CuSO_4$ solution using platinum electrodes:
i) Write the ionization reactions.
ii) Write the reactions occurring at cathode and anode.
iii) Why the intensity of blue color of solution decreases?

c) Explain the process of electrolysis of aqueous NaCl solution using platinum electrodes.

d) Define corrosion. Describe the different types of oxide layers formed in oxidation corrosion.

Q.No.5. **Answer any three of the following Questions:** 3 x 4 = 12

a) With a neat diagram, explain the oxygen absorption mechanism of electrochemical corrosion.

b) State any four principles of corrosion control by proper designing of metallic structures.

c) Explain the following methods of environment modification to control corrosion: i)Dehumidification ii)Deactivation

d) Describe the process of galvanizing for protection of metals from corrosion.

Q.No.6. **Answer any three of the following Questions:** 3 x 4 = 12

a) Describe the process of metal spraying.

b) Define Addition Polymerization. Write equation for polymerization of: i)Ethene to polyethene ii)Vinyl Chloride to Polyvinyl Chloride

c) What is vulcanization of rubber? Give the reaction for vulcanization of rubber and state why it is necessary to vulcanize natural rubber.

d) Define Galvanic Corrosion. Explain galvanic corrosion giving any two examples.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Engineering & Technology**

Subject: **Applied Physics-I (GC103)**

Time Duration: **3 Hrs.**   Max. Marks: **75**

Instructions: 1) All questions are compulsory.
     2) Figures to the right indicate full marks.
     3) Assume suitable additional data if required.

Q.No.1. **Sub-question (a) is compulsory, answer any 7 from the remaining questions:**

 a) State the relation between linear expansion (α) and cubical expression (γ)   **(1)**

 b) What is positive zero error in the case of micrometer screw gauge?   **(2)**

 c) Define least count of a Vernier Calliper. State its formula.   **(2)**

 d) Define one Newton.   **(2)**

 e) Distinguish between vectors and scalars. (any two points)   **(2)**

 f) Why curved roads are banked?   **(2)**

 g) Define radial acceleration and write down its expression.   **(2)**

 h) What is meant by critical velocity of a liquid?   **(2)**

 i) State Boyle's Law.   **(2)**

 j) Define angle of contact.   **(2)**

 k) Define: i) Variable state ii) Steady state   **(2)**

Q.No.2. **Answer any three of the following Questions:**   **3 x 4 = 12**

 a) State the fundamental quantities, their units and symbols in S.I. units.

 b) Check the correctness of the following equation using dimension:
  i)P= mgh, where P=Potential energy, m=mass, g=acceleration due to gravity, h=height

  ii)$T = 2\Pi\sqrt{\dfrac{l}{g}}$ where T=period, l=length and g=acceleration due to gravity

 c) Convert the following values from one system to another:
  i)30 Ns/m² to C.G.S. system ii)80gm.cm²/s² to S.I system

 d) Obtain the dimension Young's Modulus.

 e) State any four types of errors. Explain any one of them.

Q.No.3. **Answer any three of the following Questions:**   **3 x 4 = 12**

 a) Classify the following into scalars and vectors:
  i)Acceleration ii) Volume iii) Temperature iv) Energy
  v) Pressure vi) Voltage vii) Electric intensity vii) Magnetic flux

 b) State law of conservation of energy. Give one example of kinetic energy and potential energy.

 c) Define and write down the S.I. units of: i)Force ii) Work

 d) A locomotive pulls a train with uniform velocity 100km/hr. Find the work done by the locomotive in 10 minutes, if the force exerted is 20KN.

 e) A body is thrown vertically upwards from the ground with an initial velocity 45m/s. Find the maximum height reached by the body and the time taken to reach it.

Q.No.4. **Answer any three of the following Questions:** 3 x 4 = 12

a) Define acceleration due to gravity. Obtain an expression for it.

b) Show that $\tan\theta = \frac{v^2}{rg}$, where θ=angle of banking, v=velocity of the vehicle, r=radius of curvature of the road

c) Define centrifugal force, sate its expression and give two applications.

d) A body of mass 0.06kg is tied to a string and is whirled in a horizontal circle of radius 0.7m, making 80r.p.m. Find the tension along the string.

e) What is escape velocity? State the expression for it. Calculate escape velocity on the surface of the earth. Given radius of earth=6.4×10^6m, mass of earth=6×10^{24} kg, G=6.67×10^{-11} Nm²/kg²

Q.No.5. **Answer any three of the following Questions:** 3 x 4 = 12

a) Define shearing strain. Draw the diagram. Show that shearing strain is equal to shear angle.

b) State four applications of surface tension.

c) With a neat diagram, explain terminal velocity of a spherical body falling through viscous liquid.

d) A force of 8N required to move a liquid over a solid surface of area 0.3m² with velocity of 0.055m/s. If the thickness of the liquid layer is 0.003m, calculate coefficient of viscosity.

e) A force of 100N is applied at the lower end of a wire of length 4.5m, cross-sectional area is 0.25m². Find the elongation of the wire. Y for wire is 2×10^{11} N/m²

Q.No.6. **Answer any three of the following Questions:** 3 x 4 = 12

a) Distinguish between conduction, convection and radiation. (three points)

b) State law of thermal conductivity. Draw diagram and state its equation.

c) Define the following terms: i)Specific heat ii)Latent heat of vapourisation

d) Certain mass gas occupies 45CC at 40°C and 680mm pressure. What volume will the gas occupy at 60°C and 980mm pressure?

e) A glass window pane 1.5m long and 0.75m broad is 2mm thick. Calculate the thermal conductivity of glass if 2.5Kcal of heat is conducted per second and the temperature difference between both sides is 12°C

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Engineering & Technology**

Subject: **Applied Physics-II (GC202)**

Time Duration: **3 Hrs.**   Max. Marks: **75**

Q.No.1. **Sub question (a) is compulsory. Answer any 7 from (b) to (k):**

a)	State SI unit of electric potential.	(01)
b)	Define electric field.	(02)
c)	Define capacitance.	(02)
d)	State law of resistances in series.	(02)
e)	A potential difference of 100V is applied across a resistance of 20 ohm. Determine the current flowing through resistance.	(02)
f)	Convert 1KWh into joules.	(02)
g)	State right hand thumb rule.	(02)
h)	Define self induction.	(02)
i)	Define refraction.	(02)
j)	Give the name of any two sources of LASER.	(02)
k)	State two applications of resonance.	(02)

Q.No.2. **Answer any three of the following Questions:**   3 x 4 = 12
- **a)** State four important properties of electric lines of force.
- **b)** Two charges of 30 micro Coulomb and 50 micro Coulomb are placed 0.2m apart in air. Calculate force between them.
- **c)** Find the electric intensity at a point 0.6m from a charge of 40 micro coulomb placed in medium of dielectric constant 2.5.
- **d)** Two capacitors of 12F and 24F are connected in: i) Series ii) Parallel. Find effective capacitance in each case.
- **e)** Draw a circuit diagram with three resistances connected in parallel across a battery of V Volt. Write the equation for effective resistance.

Q.No.3. **Answer any three of the following Questions:**   3 x 4 = 12
- **a)** Define: i) Specific resistance ii) Electric power
- **b)** Draw Wheatstone's network and write balancing condition.
- **c)** The copper wire has a resistance of 4 Ohm at 0°C. Determine its resistance at 60°C. Temperature coefficient of copper = 0.00426/°C
- **d)** State Joule's law of electrical heating. Write an expression.
- **e)** A person uses, 4 number of 60W bulbs and 2 number of 100W fans, on an average 8 hours a day. Calculate energy bill for the month of 30 days at Rs. 3 per unit.

Q.No.4. **Answer any three of the following Questions:**   3 x 4 = 12
- **a)** Explain magnetic effect of electric current as demonstrated by Oersted's experiment. Write the conclusion.
- **b)** Explain the principle of transformer. Draw parts of transformer.
- **c)** i) Define Magnetic flux. ii) State Lenz's Law.
- **d)** A wire carrying current of 6A is 0.5m long. What will be the force acting on it, if it is kept in a magnetic field of strength 4.5×10^{-3} T at an angle of 60° to the direction of the field?
- **e)** Explain mutual induction with neat diagram.

Q.No.5. Answer any three of the following Questions: 3 x 4 = 12

    a) Explain total internal reflection with ray diagram.

    b) What are X rays? State three important properties of x-rays.

    c) A ray of light is travelling from air to glass. The angle of incidence is 30° and refractive index of glass is 1.5. Determine angle of refraction.

    d) i) State two properties of LASER. ii)State two applications of LASER.

    e) Two lamps of 10 Candela and 90 Candela are placed 1.5m apart. Find the position of the point between them, where luminance due to two sources will be equal.

Q.No.6. Answer any three of the following Questions: 3 x 4 = 12

    a) i) Define amplitude and frequency of sound wave.
ii)Write the relation between wavelength, frequency and velocity of a wave.

    b) Explain free and forced vibration with an example for each.

    c) Define pitch of a sound. Draw waveform to represent high pitch and low pitch sound.

    d) Explain how ultrasonic waves are used to find the depth of the sea with diagram.

    e) When a resistance of 12 Ohm is connected in the left gap of meter bridge, the null point is situated at 40cm. Find the value of resistance in the right gap.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Common**

Subject: **Engineering Materials (GC205)**

Time Duration: **3 Hrs.** Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: 5 x 3 = 15
   a) Differentiate between Metals and Non-Metals.
   b) List down the properties and uses of high speed steel.
   c) Write a note on semiconductor materials.
   d) Explain the composition and properties of Bricks.
   e) Classify magnetic materials giving two examples of each type.
   f) Write a note on lead and its hazards to environment.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
   a) State and define any three mechanical properties and any three physical properties of engineering materials.
   b) Explain any two types of cast iron along with its properties and applications.
   c) List down various constituents of aluminium alloys.
   Explain effect of these constituents on properties of metal.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
   a) Write a short note on properties and uses of stainless steel.
   b) State various desirable properties of refractory materials.
   c) List down common varieties of timber. Also state any four uses of timber.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
   a) Write a note on classification of rocks.
   b) What are insulting materials? State the characteristics and application of any two solid insulating materials.
   c) What are high conductivity materials? State properties and applications of any two high conductivity materials.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
   a) Give specification of Silicon and Germanium as semiconductor material along with their uses.
   b) What are different constituents of paints? Explain any three constituents in detail.
   c) Write a note on function of lubricants.

Q.No.6. Write short note any three: 3 x 4 = 12
   a) Magnetic properties of engineering materials
   b) Types of reinforcement materials and their applications
   c) Properties and uses to soda glass
   d) Classification materials as conductor, semiconductor and insulating materials

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Engineering & Technology**

Subject: **Engineering Maths-I (GC102)**

Time Duration: **3 Hrs.**   Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: 5 x 3 = 15

a) Find length of the Arc of a circle of radius 10cm and angle at the centre is 60^0.

b) Find equation of line having slope 3 and passing through point (2,3)

c) State nature of roots and Solve $3x^2-4x+2=0$

d) Divide x^3-5x^2+4x+1 by $(x+2)$

e) Find volume of frustum of cone having end radii as 4cm and 2cm and height of frustum is 3cm.

f) Find slope of tangent to curve $y=x^2+3x$ at (1,4)

g) Find $\dfrac{dy}{dx}$ if y= 3xtanx

h) Find centre and radius of circle $x^2+y^2=16$

Q.No.2. Answer any three of the following Questions: 3 x 4 = 12

a) Find equation of circle having (2,4) and (-1,3) as end points of the diameter.

b) Find equation of line passing through points (3,4) and (2,5)

c) Find value of p if line px+3y+1=0 is perpendicular to line 3x-y+5=0

d) Find equation of line passing through (2,3) and perpendicular to line y=4x+2

e) Find equation of circle concentric to circle $x^2+y^2-4x-2y+1=0$ and having radius 5 units.

Q.No.3. Answer any three of the following Questions: 3 x 4 = 12

a) Prove $\dfrac{\tan x + \sin x}{\tan x - \sin x} = \dfrac{1 + \cos x}{1 - \cos x}$

b) In any $\triangle ABC$ show $\dfrac{a}{bc} + \dfrac{\cos A}{a} = \dfrac{a^2 + b^2 + c^2}{2abc}$

c) Solve $\triangle ABC$ if $\angle A=102^0$, $\angle B=26^0$ and b=61cm

d) Find $\tan\theta$ and $\cot\theta$ if $\sin\theta = \dfrac{4}{5}$ and θ lies in I quadrant.

e) In $\triangle ABC$ if a = 3cm, b= 4 cm, c=5cm, find cos A and cos B

Q.No.4. Answer any three of the following Questions: 3 x 4 = 12

a) Evaluate $\lim\limits_{x \to 0} \dfrac{(4^x -1)\sin(5x)}{x^2}$

b) Evaluate $\lim\limits_{x \to 0} \dfrac{(1 + 6x)^{1/x} \tan(2x)}{x}$

c) Find maximum and minimum for the function $y=x^3-9x^2+24x$

d) If displacement S of a particle at time 't' it is given by $S=2t^3-9t^2+12t$, find time when body stops.

e) Evaluate $\lim\limits_{x \to 3} \left[\dfrac{1}{x-3} - \dfrac{3}{x^2 - 3x} \right]$

Q.No.5. **Answer any three of the following Questions:** 3 x 4 = 12

a) Find $\frac{dy}{dx}$ if: i) $y = \frac{e^{4x}}{5x+1}$ ii) $y = 5^x + 2\sec x + \log(2x)$

b) Find $\frac{dy}{dx}$ if $xy = x^2 + y^2$

c) Find $\frac{dy}{dx}$ if $y = (\tan)^x$

d) Find $\frac{dy}{dx}$ if $\log y = x^3 e^{2x}$

e) Find $\frac{dy}{dx}$ if $x = 1 + \cos(2t)$, $y = 1 - \sin(3t)$

Q.No.6. **Answer any three of the following Questions:** 3 x 4 = 12

a) Find x if: i) $\log_x 36 = 2$ ii) $\log(2x+1) + \log 3 = 3\log 2$

b) Find volume and lateral surface of pyramid whose base is hexagon of side 10cm. Given height of pyramid of 25cm and slant height is 26.46cm.

c) Find area by Simpson Rule from the given data.:

x(cm)	2	5	8	11	14	17	20	23
d (cm)	2.8	3.5	3.7	4.2	4.5	3.8	2.1	1.9

d) Find height of a prism having base as equilateral triangle of side 4cm and volume of the prism is 16cm³

e) Find $\frac{dy}{dx}$ if $y = \frac{(2x+1)^3 \sin(4x)}{e^{5x}}$

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Engineering & Technology**

Subject: **Engineering Maths-II (GC201)**

Time Duration: **3 Hrs.**   Max. Marks: **75**

Instructions: 1) All questions are compulsory.
              2) Figures to the right indicate full marks.
              3) Assume suitable additional data if required.

Q.No.1. **Answer any five of the following Questions:**   **5 x 3 = 15**

a) Find 'x' if $\begin{vmatrix} x & 5 \\ -2 & 1 \end{vmatrix} = \begin{vmatrix} 4 & 2 \\ -1 & 3 \end{vmatrix}$

b) Find a, b, c, d, if $\begin{bmatrix} a-5 & b+2 \\ 2c & d-1 \end{bmatrix} = 2\begin{bmatrix} -1 & 2 \\ 1 & 4 \end{bmatrix}$

c) Find unit vector along $\overline{AB}$, if the position vectors are

$\overline{OA} = \hat{i} + 2\hat{j} + \hat{k}$ and $\overline{OB} = 3\hat{i} + \hat{j} - 2\hat{k}$

d) Find $\bar{a}.(\bar{b} + \bar{c})$ if $\bar{a} = 2\hat{i} + 2\hat{j} + \hat{k}$, $\bar{b} = \hat{i} - \hat{j} + 4\hat{k}$ and $\bar{c} = 3\hat{i} + 2\hat{j} + 2\hat{k}$

e) Find $\int (x^2 + 1)^2 dx$

f) Evaluate $\int_0^{\log 2} e^{2x} dx$

Only for Mechanical Engg & allied branches:

g) Find mean, median and mode of the numbers 5, 3, 7, 5, 6, 4.

h) Find arithmetic mean of the frequency distribution:

Classmarks	2	4	6	8	10
Frequencies	1	3	7	6	3

Only for Electronics Engg & allied branches:

g) Find 'a' and 'b' if 2a+ib = 3+4i+7+i

h) Find $|2z_1 + z_2|$, if $z_1 = 2+3i$ and $z_2 = 8-i$

Q.No.2. **Answer any three of the following Questions:**   **3 x 4 = 12**

a) Solve by using Cramer's rule:
2x+y-z=6
3x+2y+z=7
4x-3y+2z=3

b) If the matrix $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & 2 & 1 \\ 4 & 0 & 5 \end{bmatrix}$, find A^{-1}

c) Solve using matrix method:
6x-y=2
5x+y=9

d) If $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$, show that $A^2 - 4A - 5I = 0$

e) If $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 1 & -1 \\ 4 & 2 \end{bmatrix}$; find AB and BA

Q.No.3. Answer any three of the following Questions: $\qquad$ 3 x 4 = 12

a) Show that the vectors $\bar{a} = 4\hat{i} + 3\hat{j} + 4\hat{k}$, $\bar{b} = \hat{i} + 3\hat{j} - 2\hat{k}$ and $\bar{c} = \hat{i} + 3\hat{j} + 5\hat{k}$ from sides of a right angled triangle.

-2-

b) Find angle between $\overline{AB}$ and $\overline{AC}$ with vertices A(1,1,2) B(4, 5, 3) C(3,2,4)

c) If $\bar{a} = 2\hat{i} + 2\hat{j} - \hat{k}, \bar{b} = \hat{i} + 2\hat{j} + \hat{k}$; find: i) Vector perpendicular to $\bar{a}$ and $\bar{b}$ ii) Projection of $\bar{b}$ on $\bar{a}$

d) Find the value of 'p' if $\bar{a} = p\hat{i} + 2\hat{j} - 6\hat{k}$, $\bar{b} = 4\hat{i} + \hat{j} - 3\hat{k}$, $\bar{c} = \hat{i} + \hat{j} + 2\hat{k}$ are co-planar.

e) Find the area of $\triangle ABC$, if the position vectors of A, B, C are $\overline{OA} = -\hat{i} + 2\hat{j} - \hat{k}$, $\overline{OB} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\overline{OC} = \hat{i} + 3\hat{j} + 3\hat{k}$

Q.No.4. Answer any three of the following Questions: $\qquad$ 3 x 4 = 12

a) Find $\int \left(\cos 4x + e^{2x} + 4^x + \dfrac{1}{5x + 3} \right) dx$

b) Find $\int x \sin 6x$

c) Find $\int \dfrac{1}{x^2 + 8x + 12} dx$

d) Find $\int \dfrac{1}{\sqrt{3x + 2} - \sqrt{3x - 1}} dx$

e) Find $\int \tan^5 x \sec^2 x \, dx$

Q.No.5. Answer any three of the following Questions: $\qquad$ 3 x 4 = 12

a) Find $\int \dfrac{2x + 7}{x^2 + 7x + 9} dx$

b) Evaluate $\int_0^6 \dfrac{\sqrt{x}}{\sqrt{x} + \sqrt{6 - x}} dx$

c) Find area enclosed by y=4x-3 and the lines x=1 and x=2 and X-axis.

d) Find the volume generated by rotating area above X-axis, enclosed by y²=4x, x=0 and x=1

e) Evaluate $\int_{-1}^{1} \dfrac{1}{x^2 + 2x + 5} dx$

Only for Mechanical Engg. & allied branches:

Q.No.6. Answer any three of the following Questions: **3 x 4 = 12**

a) Find the median value for the given data:

Class interval	0-20	20-40	40-60	60-80	80-100
Frequency	10	12	13	8	5

b) Find the mode value for the following data:

Class interval	1-1.9	2-2.9	3-3.9	4-4.9	5-5.9
Frequency	8	17	20	13	12

c) Find the mean deviation from the given distribution:

Class interval	0-4	4-8	8-12	12-16
Frequency	2	6	7	5

d) Find standard deviation from the data given below:

Class mark (x_i)	5	10	15	20	25
Frequency (f_i)	12	16	24	11	7

e) Find mean deviation and standard deviation of the numbers 3, 5, 7, 4, 1

Only for Electronic Engg. and allied branches:

Q.No.6. Answer any three of the following Questions: **3 x 4 = 12**

a) Express in Polar form: i) $z_1 = \sqrt{3} + i$ ii) $z_2 = -1 - i$

b) If $z_1 = 3-2i$, $z_2 = 4+3i$ and $z_3 = 2+i$; find: $(z_1-z_2)(z_2-z_3)$

c) Find 'a' and 'b' if: $a + ib = \dfrac{(1+2i)(2-3i)}{4-i}$

d) Express in the form a+ib, $\dfrac{i^{17} - 3i^{15} + i^8}{2 + i^6 - i^3}$

e) Simplify using De Moivre's theorem:

$$\frac{(\cos 2\theta - i\sin 2\theta)^2 \left(\cos \frac{\theta}{3} + i\sin \frac{\theta}{3}\right)^9}{(\cos 5\theta + i\sin 5\theta)^{\frac{3}{5}}\left(\cos \frac{30}{4} - i\sin \frac{30}{4}\right)^8}$$

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Common**

Subject: **Environmental Studies (GC203)**

Time Duration: **3 Hrs.**   Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: 5 x 3 = 15
  a) What is Ecological Footprint?
  b) Name any six Biogeographical zones of India.
  c) What is land degradation? List the methods of control of land degradation.
  d) How is high activity radioactive waste disposed?
  e) What are secondary air pollutants? Give example.
  f) Explain the role of decomposers in an ecosystem.
  g) State any six rules you will follows as not to violate Motor Vehicle Act.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
  a) Write a note on Environment Impact Assessment.
  b) Discuss the environmental ethics to be developed as true earth citizen.
  c) State any six Human Rights.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
  a) Explain primary ecological succession.
  b) Write a note on In-Situ or Ex-Situ method of conservation of biodiversity.
  c) Describe: i) Desert Ecosystem ii) Ocean Ecosystem

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
  a) Discuss the effect of excessive use of synthetic pesticides in modern agriculture on environment.
  b) Discuss any six drawbacks of construction of dams.
  c) What are the causes of deforestation? Explains the steps taken for forest management.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
  a) What is Green House effect and Global Warming? Explain its effects.
  b) Discuss how pathogens and heavy metals in polluted water affect human health.
  c) Explain the method of composting of wet waste and methods of waste utilization with examples.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12
  a) Discuss the effects of noise pollution on human health. What precautions will you take to protect yourself from noise pollution?
  b) Discuss the short term and long term effects of marine water pollution due to oil spills.
  c) Explain the role of Information Technology in environment.

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BOARD OF TECHNICAL EDUCATION
PORVORIM-GOA
November, 2025 Examinations

Programme: **Architecture**

Subject: **Environmental Science For Architecture(AA106)**

Time Duration: **3 Hrs.**   Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: 5 x 3 = 15
a) With a suitable example explain food chain.
b) What is the environmental impact of mining?
c) State any three sources of solid waste.
d) Define Urban Ecology.
e) State the disadvantages of wind energy generation.
f) What is an ecological pyramid?

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12
a) Explain in detail the biotic component of an ecosystem.
b) Explain the various methods of in-situ conservation of biodiversity.
c) With suitable examples explain bio-mimicry-innovative ways inspired by nature.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12
a) What is rain water harvesting? State its various benefits.
b) State the causes of deforestation.
c) What are the various sources of food resource? Explain each in brief.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12
a) What is noise pollution? State the effect of noise pollution on human health.
b) Write a detail note on sustainable development goals by the United Nations. (UN)
c) Discuss the effects of air pollution on human health.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12
a) Explain in brief the following problems encountered:
i) Unplanned growth of city ii) Population density
b) What are the mitigation strategies to be implemented in a city to make it livable with respect to the issue of energy?
c) Give a case study of an urban area in the state of Goa. State the problems faced at present and suggest corrective measures.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12
a) State the advantages and disadvantages of nuclear energy.
b) Draw a neat sketch of the working of the electricity generating system using solar energy. Explain in brief.
c) Write short note on: i) Geothermal energy ii) Bio gas

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