

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Explain briefly the following physical properties of materials:
i) Melting point ii) Boiling point or freezing point
iii) Coefficient of linear expansion
- Enlist any five differences between ferrous and non ferrous metals.
- List the properties of aluminium that makes it a useful engineering metal. Also mention the various alloys of aluminium.
- What is cement? Give the main ingredients of cement.
- Give the various functions of lubricants. What are the types of lubricants?
- Give characteristics of solid insulating materials.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Explain any four mechanical properties of the engineering materials.
- List the types of cast iron and give their properties and uses.
- What is meant by chemical properties of engineering materials? Elaborate.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- What are tool steels? Give its composition, properties and uses.
- State classification and properties of bricks.
- What are the desirable properties of refractories? Give their applications.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Discuss the important characteristics of clay. List down the products of clay.
- Write short note on: i) Fibre glass ii) Glass wool iii) Abrasives
- Explain the various constituents of paints.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Explain the following:
i) Dielectric strength ii) Electrical resistivity iii) Permeability
- State and explain properties and applications of any three high conductivity materials.
- State the specifications and uses of the following semi conductor materials: i) Silicon ii) Germanium

Q.No.6. Write short note on any three:

3 x 4 = 12

- Lead and its hazard to the environment
- Oil based and polymer based paints
- Diamagnetic, paramagnetic and ferromagnetic materials
- Common building stones and their applications
- Insulating materials

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Explain the importance of Environmental Studies.
- What is the aesthetic value of biodiversity?
- Give any two examples of water conflict in India.
- State the causes of land degradation.
- Why is it necessary to separate dry and wet waste?
- List the major sources of noise pollution.
- State the objectives of Environment Protection Act.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- What is sustainable development? State any five guidelines for sustainable development.
- Write a note on environmental audit.
- Discuss the need for women and child welfare and name any four schemes of the Government for women and child welfare.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- With suitable examples explain food chain and food web.
- Draw and explain: i)Pyramid of number for grassland ecosystem ii)Pyramid of biomass for pond ecosystem
- Discuss the various threats to biodiversity.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Discuss the causes and effects of deforestation.
- Explain the effects of mining activities on the environment.
- What are non-renewable sources of energy? Discuss any two alternate sources of energy in use.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- What is acid rain? State its causes and effects.
- Draw the flow sheet diagrams of primary and secondary treatment of waste water.
- What is radioactive waste? Write a note on hazards of exposure to radioactive waste.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- Discuss the effects of air pollution on human health.
- State the objectives of the following Acts:
i)Wildlife Protection Act ii)Forest Conservation Act
- Explain the role you will play in educating the people in your locality to prevent different types of pollution.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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) Give two examples of fundamental unit. (01)
- b) State the principle of homogeneity. (02)
- c) What is meant by banking of roads? (02)
- d) State law of conservation of energy. (02)
- e) Give the relation between linear speed and angular velocity. (02)
Convert 50rpm to rad/sec.
- f) Write any two examples of centripetal force. (02)
- g) Define yield point. (02)
- h) What is streamlined flow? (02)
- i) Define cohesive force. (02)
- j) Define convection. (02)
- k) State the relation between α and β being coefficient of linear and areal expansion. (02)

Q.No.2. Answer any three of the following Questions:

3 x 4 = 12

- a) Check the correctness of the following equation $P = h \rho g$: where P =pressure, h =height, ρ =density, g =acceleration due to gravity
- b) Write down seven fundamental quantities and their units in the SI system.
- c) Explain positive and negative error in micrometer screw gauge with a neat diagram.
- d) i) Convert 1000 Kg/m^3 in gm/cm^3
ii) State types of errors in measurement
- e) A body of mass 2 Kg is at a height of 40 m above the ground moving with velocity 20 m/s . Calculate its kinetic energy and potential energy.

Q.No.3. Answer any three of the following Questions:

3 x 4 = 12

- a) Define scalar and vector quantities.
- b) Define uniform acceleration. State three points of difference between distance and displacement.
- c) A ball is dropped from the top of a tower which is 120 m high. With what velocity will it hit the ground?
- d) Define: i) One Joule ii) Acceleration due to gravity
- e) An object travels with an initial velocity of 20 m/s and acceleration 4 m/s^2 . Find the distance covered by the object in 10 seconds.

Q.No.4. Answer any three of the following Questions:

3 x 4 = 12

- a) State Newton's law of gravitation. Write the formula for the gravitational force and indicate what each term represents.
- b) Define the following terms: i) Super elevation ii) Periodic time of a satellite
- c) Define escape velocity. Write an expression for escape velocity and indicate what each term in the expression represents.
- d) A mass of 50 Kg rotates in a horizontal circle of radius 5 m at a speed of 8 rpm . Calculate the centripetal force acting towards the centre of the circle.

- e) Calculate the acceleration due to gravity at the earth's surface. Take the earth's radius as $6.4 \times 10^6 \text{ m}$ and earth's mass as $5.98 \times 10^{24} \text{ Kg}$ ($G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{Kg}^2$)

Q.No.5. Answer any three of the following Questions:

3 x 4 = 12

- a) i) State Hooke's law.
ii) Define Bulk modulus.
- b) A steel wire of length 3.14 m and radius of $0.6 \times 10^{-3} \text{ m}$ has its upper end tied to a beam. If a mass of 3 Kg is attached to its lower end, find the extension produced in the wire. Take $Y = 2 \times 10^{11} \text{ N/m}^2$
- c) Define surface tension. Write an expression for surface tension and indicate what each term in the expression represents.
- d) State Newton's law of viscosity. Derive an expression for force of viscosity.
- e) Calculate the viscous force on a spherical body of radius 0.02 m falling through a liquid of viscosity 1.2 Ns/m^2 when its terminal velocity is 0.14 m/s .

Q.No.6. Answer any three of the following Questions:

3 x 4 = 12

- a) Define the following:
i) Terminal velocity
ii) Latent heat of vaporization
- b) State and derive Boyle's law.
- c) A gas occupies a volume of 30 cm^3 at a pressure of 280 mm and a temperature of 27°C . Find its volume at a pressure of 600 mm and a temperature of 57°C .
- d) State the factors on which quantity of heat conducted depends. Write an expression for heat conducted.
- e) A copper rod of 1 m length expands by 0.2 cm when heated from 20°C to 90°C . Calculate the coefficient of linear expansion.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA
April, 2026 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

- Find the equation of a circle having centre (3,4) and radius 8 units.
- Solve and comment on the nature of roots of the quadratic equation $x^2+x-8=0$
- Divide the polynomial $2x^3+4x-20$ by $x-2$
- Find arc length and area of sector of a circle having radius 7cm and arc subtends an angle 70° at the centre of the circle.
- Find the volume of a pyramid whose base is a square of side 6cm and the height of the pyramid is 15cm.
- Evaluate $\lim_{x \rightarrow 2} \frac{x^2+3x-10}{x^2-3x+2}$
- Find $\frac{dy}{dx}$ if $y=2x^8+4\log x+7^x$

Q.No.2. Answer any three of the following Questions:

3 x 4 = 12

- Find the perpendicular distance from (4,5) to the line $3x+4y-2=0$
 - Find slope and Y-intercept of the line $2x-3y+4=0$
- Find the equation of a line passing through the point (-2,7) and perpendicular to the line $3x-y+6=0$
- Find the equation of median CD of $\triangle ABC$ with vertices A(8,-2), B(2,-4) and C(1,3)
- Find the acute angle between the lines $5x+y-2=0$ and $2x-y+5=0$
- Find the equation of a circle having centre (2,5) and passing through a point (8,13)

Q.No.3. Answer any three of the following Questions:

3 x 4 = 12

- Find the equation of a circle having diameter the line segment joining (3,6) and (5,2). Hence, find the centre and radius of the circle.
- Find x and y is degrees, if $2x+3y=130^\circ$ and $3x+y=\pi/2^c$
- If $\sin A = \frac{3}{5}$, $\cos B = \frac{-5}{17}$, A and B lies in II quadrant, find $\cos(A+B)$
- Prove that: i) $\tan A + \cot A = \sec A \operatorname{cosec} A$
ii) $\frac{\sin 5\theta - \sin 3\theta}{\cos 5\theta + \cos 3\theta} = \tan \theta$
- Solve the $\triangle ABC$, if $a=12\text{cm}$, $b=8\text{cm}$, $c=10\text{cm}$

Q.No.4. Answer any three of the following Questions:

3 x 4 = 12

- Find x if: $\log^{(x-1)} 2$ ii) $\log(2x+8) - \log x = 2 \log 2$
- Evaluate: $\lim_{\theta \rightarrow 0} \frac{\cos 10\theta - \cos 4\theta}{\theta^2}$
- Find the volume of frustum of a pyramid whose top and base are equilateral triangles of sides 4cm and 6cm respectively. The height of the frustum is 16cm
- Find the volume and curved surface of frustum of a cone with diameters of top and base as 8cm and 18cm. The height of the frustum is 12cm.

...2/-

- e) Find the volume of Simpson's rule, if the areas of cross sections at intervals of 6m are 35, 43, 65, 83, 94, 103 and 115m²

Q.No.5. Answer any three of the following Questions:

3 x 4 = 12

- a) Evaluate: $\lim_{x \rightarrow 0} \frac{(8^x - 1)(e^{3x} - 1)\log(1 + 4x)}{x^3}$
- b) Evaluate: $\lim_{x \rightarrow 4} \left[\frac{1}{x-4} - \frac{2}{x^2 - 6x + 8} \right]$
- c) Find the equation of normal to the curve $y = 3x^2 + 2x + 4$ at $(-1, 5)$
- d) Find maxima and minima for the function $y = 2x^3 - 9x^2 + 12x + 5$
- e) The displacement of a particle at time 't' is given by $s = 2t^3 - 6t^2 + 8t + 9$ cm. Find: i) When will the acceleration of the particle become zero? ii) The velocity at that time

Q.No.6. Answer any three of the following Questions:

3 x 4 = 12

- a) Find $\frac{dy}{dx}$, if: i) $y = \sqrt{x} \sin x$ ii) $y = \frac{\cos x}{4x + 3}$
- b) Find $\frac{dy}{dx}$, if $x^6 + 2y^3 + x^4y^2 = 0$
- c) If $y = \sin 4\theta$, $x = \cos 4\theta$, find $\frac{dy}{dx}$
- d) Find $\frac{dy}{dx}$, if: i) $y = \log(\sec x)$ ii) $y = e^{\tan x}$
- e) if $y = (x^3 + 5)^x$, find $\frac{dy}{dx}$

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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:

5 x 3 = 15

- Define quantum numbers. State the number of sub shells present in second energy shell and give the maximum number of electrons in each sub shell.
- 'Filling of 4s orbital takes place before 3d orbital', justify the statement.
- Define hard and soft water. Write the reaction for removal of temporary hardness of water by boiling.
- Schematically represent the process of electrolysis of fused NaCl using carbon electrodes.
- Give reasons for following:
 - Small anodic area results in intense localized corrosion
 - Steel screws in bass marine hardware corrodes
- Define corrosion. Which factors are essential for electrochemical corrosion to take place?
- Define polymer and monomer. Write reaction for polymerization of tetrafluoroethene to polytetrafluoroethene.
- Write any one equation for removal of permanent hardness of water by zeolite process
 - Why electrolytic solution as a whole is always neutral?

Q.No.2. Answer any three of the following Questions:

3 x 4 = 12

- Differentiate between energy level and sub energy level giving four points.
- How ionic bond is formed? Explain the formation of NaCl molecule by electrovalency.
- State Pauli's Exclusion principle. Write the orbital electronic configuration of following elements:
 - Potassium
 - Silicon
 - Nitrogen
- Explain Lewis and Langmuir concept of stable electronic configuration.

Q.No.3. Answer any three of the following Questions:

3 x 4 = 12

- With reference to ion exchange process of water softening:
 - Write one reaction each occurring in cation and anion exchange resin process
 - Write the reaction for regeneration of exhausted cation exchange resin
 - Why the water obtained is called deionised water?
- What are the ill effects of using hard water for:
 - Textile and dyeing industry
 - Paper industry
- With the help of diagram, explain the reverse osmosis process for desalination of brackish water.
- Give two points of difference between sludge and scale.
 - Define pH. What is the pH range of strongly acidic and strongly basic solution?

Q.No.4. Answer any three of the following Questions:

3 x 4 = 12

- Define degree of ionization. Explain any three factors affecting degree of ionization.

...2/-

- b) In the electrolysis of aqueous CuSO_4 solution using copper electrodes:
i) Write the ions present in the solution
ii) Write the reaction at cathode and anode
iii) Why does the strength of CuSO_4 solution remains the same?
- c) Define electrochemical series? Explain the significance of electrochemical series giving two points.
- d) With the help of diagram, explain the hydrogen evolution mechanism of electrochemical corrosion.

Q.No.5. Answer any three of the following Questions:

3 x 4 = 12

- a) Give four points of difference between galvanizing and tinning.
- b) Explain the following methods of corrosion control by environment modification:
i) Deaeration ii) Alkaline neutralization
- c) What is the principle cathodic protection? Describe the sacrificial anodic protection method giving a suitable example.
- d) i) 'Pure metal rod half immersed vertically in water starts corroding from bottom', give reason.
ii) Name the different types of oxide films formed in oxidation corrosion. In which type of oxide film, corrosion does not occur and why?

Q.No.6. Answer any three of the following Questions:

3 x 4 = 12

- a) What is electroplating? How is the process of electroplating carried out?
- b) Write four points of difference between thermoplastic and thermosetting plastic.
- c) Explain the following properties of synthetic rubber and give their related applications:
i) Abrasion resistance ii) Elasticity
- d) Define concentration cell corrosion. Explain metal ion concentration cell corrosion.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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 the values of x, y, z , if $\begin{bmatrix} x+5 & y-3 \\ 6z & 8 \end{bmatrix} = \begin{bmatrix} -5 & -1 \\ 1 & 8 \end{bmatrix}$
- b) If $\begin{vmatrix} 1 & k \\ 2 & 4 \end{vmatrix} = \begin{vmatrix} 4 & 3 \\ 8 & 1 \end{vmatrix}$, find the value of k
- c) Find $|\vec{a} - \vec{b}|$ given $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$, $\vec{b} = 3\hat{i} - \hat{j} + \hat{k}$
- d) Find $\int (\sin 5x + 6^x - \cot 3x) dx$
- e) Determine if the vectors $\vec{a} = 6\hat{i} - 5\hat{j} + 3\hat{k}$ and $\vec{b} = -4\hat{i} - 3\hat{j} + 3\hat{k}$ are perpendicular to each other.
- f) Evaluate $\int_0^4 e^{2x} dx$
- g) Express the number $Z=1+i$ in its polar form(Only for students of Elex & allied courses)
- g) Obtain the mean, median and mode of:
11, 8, 16, 13, 10, 8(Only for students of Mech. Engg. & allied courses)

Q.No.2. Answer any three of the following Questions:

3 x 4 = 12

- a) Solve using Cramer's Rule: $x+2y+z=4$, $2x-y-z=1$, $x-y+2z=-3$
- b) Find A^{-1} given $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$
- c) Solve using Matrix Method: $2x-y=10$, $x+3y=-2$
- d) If $A = \begin{bmatrix} 3 & 2 \\ -1 & -2 \end{bmatrix}$ find $A^2+5A-2I$, where I is the identity matrix.
- e) Given $A = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$, show that $A + A^t$ is a symmetric matrix.

Q.No.3. Answer any three of the following Questions:

3 x 4 = 12

- a) $\int \frac{6x^2 + x - 1}{2x - 1} dx$
- b) $\int \frac{1}{x^2 - 12x + 11} dx$
- c) $\int x \cos 2x dx$
- d) $\int \frac{e^x}{e^{2x} + 1} dx$
- e) $\int \frac{(\log x)^5}{x} dx$

Q.No.4. Answer any three of the following Questions:

3 x 4 = 12

- a) Given $\vec{a} = 5\hat{i} + \hat{j} - 2\hat{k}$, $\vec{b} = 2\hat{i} - 3\hat{j} + \hat{k}$, find $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b})$

...2/-

- b) Find $\bar{q} \times \bar{r}$ for the vectors $\bar{q} = 2\hat{i} - \hat{j} - \hat{k}$, $\bar{r} = \hat{i} - \hat{j} + \hat{k}$
- c) Calculate the angle between the vectors: i) $\bar{a} = \hat{i} + 4\hat{j} - \hat{k}$ and $\bar{b} = \hat{i} + 2\hat{j} - 3\hat{k}$
- d) If $\bar{a} = 2\hat{i} - 2\hat{j} - \hat{k}$, $\bar{b} = 3\hat{i} + 2\hat{j} + \hat{k}$, $\bar{c} = \hat{i} - \hat{j} - 3\hat{k}$, find the projection of $2\bar{a} - \bar{b}$ on $\bar{c}$
- e) Show that the vectors $\bar{a} = -\hat{i} + 2\hat{j} + 3\hat{k}$, $\bar{b} = 3\hat{i} + \hat{j} - 2\hat{k}$, and $\bar{c} = 2\hat{i} + 3\hat{j} + \hat{k}$, form the sides of an equilateral triangle.

Q.No.5. Answer any three of the following Questions:

3 x 4 = 12

- a) Find $\int \left(\frac{1}{4+5x} + e^{1-6x} + \tan 4x + \sqrt{x} \right) dx$
- b) $\int \frac{1}{\sqrt{2x+1} - \sqrt{2x-1}} dx$
- c) Evaluate $\int_2^5 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{7-x}} dx$
- d) Find the area enclosed by the parabola $x^2 = 4y$ and the lines $x=1$ and $x=3$
- e) Calculate the volume obtained by revolving the area enclosed by $x=8y$, the Y-axis $y=0$, $y=2$ about the Y-axis.

Q.No.6. Answer any three of the following Questions:

3 x 4 = 12

(Only for students of Elex. Engg. & allied courses)

- a) Given $(7-4i) (-2+3i) = a+ib$, find a and b
- b) Simplify $\frac{i^6 + 4i^5}{i^8 + i}$
- c) Use De Moivre's theorem to simplify:

$$\frac{(\cos 8\theta + i \sin 8\theta)^{3/4} (\cos 2\theta + i \sin 2\theta)^3}{\left(\cos \frac{\theta}{2} + i \sin \frac{\theta}{2} \right)^{-8} (\cos 4\theta - i \sin 4\theta)^{5/2}}$$
- d) Express the complex number $Z = -\frac{1}{2} - \frac{1}{2}i$ in its exponential form.
- e) If $Z_1 = 2-3i$, $Z_2 = 4+i$, find: i) $|Z_1 \cdot \bar{Z}_2|$ ii) $4Z_2 - 2Z_1$

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

(Only for students of Mech. Engg. & allied courses)

- a) Calculate the median and the mode of the weekly income of employees in a certain industry from the following data:

Weekly Income (Rs.)	0-1000	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000
No. of employees	100	190	250	100	50	20

- b) Find the standard deviation for the following distribution giving the lengths of 155 steel rods:

Length (cm)	42	43	44	45	46	47	48	49	50
No. of rods	10	13	12	15	20	23	17	20	25

- c) Calculate the mean deviation for the following data giving the average rainfall on a particular day recorded at 90 places:

Average Rainfall (mm)	20-30	30-40	40-50	50-60	60-70	70-80
No. of Places	14	16	18	20	22	10

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Engineering & Technology**

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

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 (b) to (k):

- | | |
|---|------|
| a) State the unit of capacitance. | (01) |
| b) 1000J of work is done in bringing the charge of 4 micro coulomb. Calculate the electric potential. | (02) |
| c) Convert 1KWh to joules. | (02) |
| d) State the law of resistances in parallel. | (02) |
| e) State Lenz's law. | (02) |
| f) What is a step-down transformer? | (02) |
| g) Write the expression for magnetic induction at the centre of a circular coil current carrying conductor. | (02) |
| h) State two important properties of X rays. | (02) |
| i) Define luminous intensity. | (02) |
| j) Write the full form of LASER. | (02) |
| k) Define echo. | (02) |

Q.No.2. Answer any three of the following Questions:

3 x 4 = 12

- State four important properties of electric lines of force.
- Find the electric intensity at a point 0.4m from a charge of 48 micro coulomb placed in a medium of dielectric constant 2.4.
- Obtain an equation for effective capacitance when three capacitors are connected in series.
- Two equal charges of 10 micro coulomb are separated by 0.5m and placed in a medium of dielectric constant 1.5. Calculate the force between them.
- i) How and what resistance must be connected to a 10 ohm resistance so that effective resistance is 25 ohm?
ii) A lamp is marked 200V, 100W. Calculate the amount of current that flow through it.

Q.No.3. Answer any three of the following Questions:

3 x 4 = 12

- Draw a neat circuit diagram for comparing emf of two cells by sum and difference method. Write the equation for comparing emf using this method.
- A wire of length 2m radius 0.15mm has resistance of 10 ohm. Calculate specific resistance of the material of the wire.
- i) State Ohm's law ii) Define EMF
- The emf of a battery is 25V and internal resistance of the cell is 5 ohm. When the external conductor is introduced, the potential difference between them is 15V. Calculate the current flowing through the conductor and its resistance.
- What is heating effect of electric current? Write the expression for heat generated in a current carrying conductor and also what each term in the expression indicates.

Q.No.4. Answer any three of the following Questions:

3 x 4 = 12

- a) Explain self induction with a neat diagram.
- b) A wire carrying current of 4A is 0.6m long. What will be the force acting on it, if it is kept in a magnetic field of strength $5 \times 10^{-2} \text{Wb/m}^2$ at an angle of 30° to the direction of the field?
- c) i) State Fleming's left hand rule.
ii) Write an expression for emf generated in a coil placed in a magnetic field.
- d) A transformer has 500 primary turns and 2000 secondary turns. The input voltage is 4V and the output current is 2A. Determine: i) Output voltage ii) Input current
- e) Explain magnetic effect of electric current as demonstrated by Oersted's experiment.

Q.No.5. Answer any three of the following Questions:

3 x 4 = 12

- a) What conditions are necessary for total internal reflection? Give two examples of total internal reflection.
- b) Two lamps of 12 candela and 48 candela are placed 1.6m apart. Find the position of the point between them, where the illuminance due to the two sources is equal.
- c) Draw a ray diagram showing refraction through a prism. Write an expression for refractive index in minimum deviation position.
- d) Light is travelling from glass to air. Refractive index of glass is 1.5. Find the critical angle.
- e) i) State inverse square law of illumination.
ii) Define critical angle.

Q.No.6. Answer any three of the following Questions:

3 x 4 = 12

- a) Define pitch of a sound. Draw a waveform to represent high pitch and low pitch sound.
- b) Explain free and forced vibrations giving examples of each.
- c) What is piezo electric effect? How are ultrasonic waves produced using piezo electric effect?
- d) Explain how ultrasonic waves are used to find the depth of sea bed.
- e) The brass wire has a resistance of 5 ohm at 0°C . Determine its resistance at 40°C . (Temperature coefficient of copper = $0.0015/^\circ\text{C}$)
