BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2022 Examinations

Programme: **Engineering & Technology**

Subject: **Engineering Materials (GC205)/(GN205) [Rat/Rev]**

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

Instructions: 1) Q.No.1 is compulsory. Answer any 4 from the remaining questions.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

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

a) Define the following properties of materials: (i) Thermal conductivity (ii) Malleability (iii) Thermo-electricity.

b) Write down any three important points of differences between acid and basic refractories.

c) List down the important characteristics of good insulating materials.

d) Write a note on 'Sand as a construction material'.

e) State the features and applications of ferromagnetic materials.

Q.No.2. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) State the properties and uses of low carbon steel. **(3)**

b) What do you mean by a metal and a non-metal? Differentiate between metal & non-metal. **(6)**

c) What are alloy steels? State the effect of various constituents of alloy steels on properties of materials. **(6)**

d) What is the difference between cast iron & steel? State the properties & uses of Grey cast iron. **(6)**

Q.No.3. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) Write a note on 'Chemical properties of engineering materials'. **(3)**

b) State four properties & two applications of (i) Duralumin (ii) Muntz Metal. **(6)**

c) State the properties and uses of Glass Wool. **(6)**

d) Write a note on composite material. **(6)**

Q.No.4. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) Write a note on 'Building stones & its uses'. **(3)**

b) What are the characteristics required for a good insulating material? **(6)**

c) State the properties and applications of following conductor materials: (i) Manganin (ii) Tungsten **(6)**

d) Explain the various constituents of paints. **(only for students of Rationalised scheme)** **(6)**

d) Write down characteristics of good building stone. **(only for students of Revised Scheme)** **(6)**

Q.No.5. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) Write a note on classification of rocks. **(3)**

b) List the types of cement. Also state the composition and applications of any two types of cement. **(6)**

c) State the main constituents of bricks. Also explain the classification of bricks. **(6)**

d) Write a note on semiconductor materials. **(6)**

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Q.No.6. Write short notes on: **3 x 5 = 15**

a) Lead and its hazard to the environment

b) Effect of constituents of copper alloys on properties of metal

c) Functions of lubricants **(only for students of Rationalised scheme)**

c) Vulcanization process **(only for students of Revised scheme)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2022 Examinations

Programme: **Common**

Subject: **Environmental Studies (GC203)/(GN203) [Rat/Rev]**

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

Instructions: 1) Q.No.1 is compulsory. Answer any 4 from the remaining questions.
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) State the objectives of Environmental studies.
b) What do you understand by Ecological Footprint?
c) What is Environmental Audit?
d) Explain the three types of diversity.
e) Why is there a need for conservation of water resource?
f) State the long term effects of pollution of marine water due to oil spills.
g) What is your individual responsibility as a true Earth citizen? **(only for students of Rationalised scheme)**
g) Suggest any six changes you will do in your life style to be environmentally friendly. **(only for students of Revised scheme)**

Q.No.2. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) What is sustainable development? State any four guidelines for sustainable development. **(3)**
b) Explain the flow of energy in an ecosystem and draw the pyramid of energy. **(6)**
c) Explain In-Situ conservation of Biodiversity. **(6)**
d) Describe Desert Ecosystem. **(only for students of Rationalised scheme)** **(6)**
d) Describe the characteristic features of any ecosystem you have visited. **(only for students of Revised scheme)** **(6)**

Q.No.3. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) Discuss aesthetic value of Biodiversity. **(3)**
b) State the effects of deforestation. What are the steps taken to conserve forest? **(6)**
c) What are renewable and non renewable energy resources? Discuss any two alternate sources of energy. **(6)**
d) Discuss the causes of land degradation. How land degradation can be controlled? **(6)**

Q.No.4. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) Explain the two world food problems. **(3)**
b) What is radioactive pollution? Explain the nuclear hazards. **(6)**
c) Why is separation of dry and wet waste at the source important? With examples explain the three ways of waste utilization. **(6)**
d) State the major sources of noise pollution. Discuss the effects of noise pollution on human health. **(6)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2022 Examinations

Programme: **Engineering & Technology**

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

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

Instructions: 1) Q.No.1 is compulsory. Answer any 4 from the remaining questions.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer the following: **5 x 3 = 15**

a) Find 'x' if $\begin{vmatrix} x+1 & 3 \\ x-2 & 4 \end{vmatrix} = 0$

b) Find x, y, z if $\begin{bmatrix} x+y & 5 \\ y-1 & z \end{bmatrix} = \begin{bmatrix} 8 & 5 \\ 3 & 0 \end{bmatrix}$

c) Evaluate $\int (x^5 - 4\cos 2x - \operatorname{cosec}^2 x + 7x - 1)dx$

d) Find $\bar{a} \cdot \bar{b}$ and $\bar{a} \times \bar{b}$ if $\bar{a} = i + j + k$ & $\bar{b} = i - j + k$.

e) Find Mean, Median and Mode of 12, 21, 32, 23, 42, 24, 15, 51. **(Only for Mechanical Engg. & Allied branches)**

e) Express into Polar form $z = (1 - i)$. **(Only for Electronics Engg. & Allied branches)**

Q.No.2. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) If $A = \begin{bmatrix} 2 & 1 \\ 4 & -3 \end{bmatrix}$ find AA^T. **(3)**

b) Solve by Cramer's rule **(4)**

$x + 2y + z = 0$

$3x + y - z = 1$

$x + y + z = 1$

c) Find A^{-1} if $A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ **(4)**

d) Solve by matrix method $x + 2y = 4$, $3x + y = 7$. **(4)**

e) If $A = \begin{bmatrix} 4 & -1 \\ 2 & 3 \end{bmatrix}$ find $A^2-3A+2I$. (I is Identity matrix) **(4)**

Q.No.3. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) $\int \frac{x^2 + 4x - 1}{x} dx$ **(3)**

3 x 4 = 12

b) $\int x \sin 5x dx$

c) $\int \frac{1}{x^2 - 8x + 17} dx$

d) $\int_2^5 \frac{\sqrt{x}}{\sqrt{7-x} + \sqrt{x}} dx$

e) $\int \frac{e^x}{4 + e^{2x}} dx$

Q.No.4. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) Find x if $\bar{a} = xi - 2j + 3k$ is perpendicular to $\bar{b} = 2i + 5k$. **(3)**

b) Find unit vector along $\overline{AB}$ if A=(1, 2, 3), B=(2, -1, 5). **(4)**

c) Find angle between vectors $\bar{a} = 3i - 2j + k$ and $\bar{b} = 2i + 3j$. **(4)**

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d) Find the volume of a parallelopiped with the coterminus edges given by $\bar{a} = i - 2j + k$, $\bar{b} = 3i + 2j + k$, $\bar{c} = i + j + 5k$. **(4)**

e) Find the area of parallelogram determined by vectors $\bar{a} = 3i + j - 2k$, $\bar{b} = i - 3j + 4k$. **(4)**

Q.No.5. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) $\int \sin^2 x \cos x dx$ **(3)**

b) $\int \frac{x+3}{(x+1)(x+2)} dx$ **c)** $\int \cos^2 x dx$ **d)** $\int_0^1 2^x dx$ **3 x 4 = 12**

e) Find the volume generated by revolving area enclosed by y = 6x, x=0, x=4 about X-axis.

Only for Mechanical Engg. & Allied Branches:

Q.No.6. Sub question (a) is compulsory. Answer any 2 from (b), (c), (d):

a) A mean of 20 items is 76. If 2 items with values 56 & 65 are added to data. Find the revised mean. **(3)**

b) Find Mean, Median and Mode **(6)**

Class interval	0-6	6-12	12-18	18-24	24-30
Frequency	2	5	8	4	1

c) Calculate Mean deviation **(6)**
11, 13, 15, 17, 19, 21, 23, 25

d) Using integration find area enclosed by y = 4x + 1 **(6)**
X =1 & x = 2 & X-axis.

Only for Electronics Engg. & Allied Branches:

Q.No.6. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) Express into $a + ib$ form $\frac{(2+3i)(1-i)}{i^{20}}$ **(3)**

b) Simplify using De Moivre's theorem **(4)**
$$\frac{(\cos 4\theta + i \sin 4\theta)^2 (\cos 3\theta - i \sin 3\theta)^{2/3}}{(\cos\theta + i \sin\theta)^7 (\cos\theta - i \sin\theta)}$$

c) Solve using complex numbers $x^4 = 1$ **(4)**

d) If $z_1 = 3 - 4i$, $z_2 = 2 + 5i$ find i) $2z_1 + 3z_2$ ii) $\frac{z_1}{z_2}$. **(4)**

e) Separate into real and imaginary sin(x+iy). **(4)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2022 Examinations

Programme: **Engineering & Technology**

Subject: **Engineering Maths-I (GC102)/(GN102) [Rat/Rev]**

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

Instructions: 1) Q.No.1 is compulsory. Answer any 4 from the remaining Questions.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer the following:

a) Find the equation of a line passing through the point (2, 5) and having slope 2. **(2)**

b) Find the area of sector of a circle which subtends an angle 30° at the centre of the circle and radius of the circle is 10cm. **(2)**

c) Evaluate $\lim_{x\to 3}\frac{x^2+2x-15}{x^2-9}$ **(2)**

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

Only for students of Rationalised scheme:

e) Solve the quadratic equation and state the nature of roots. **(2)**
$x^2-5x+7=0$

f) Find the volume of a Prism whose base is an equilateral triangle of sides 4cm and the height of the Prism is 15cm. **(2)**

g) Divide the polynomial $x^4-x^3+2x^2+5x+4$ by x-2. **(3)**

Only for students of Revised scheme:

e) Prove that $\sin(450+\theta) + \sin(270+\theta) = 0$ **(2)**

f) Find the co-ordinate of a point which divides the line segment joining A(2, 5) and B (-1, 3) externally in the ratio 1:3. **(2)**

g) Find x, if the distance between A(x, -3) and B(7, 5) is 10cm. **(3)**

Q.No.2. Sub question (a) is compulsory. Answer any three from (b), (c), (d), (e):

a) Find the slope, X-intercept and Y intercept of the straight line $3x-5y+30=0$ **(3)**

b) Find the equation of a line which passes through the point of intersection of the lines $x + y = 10$ and $3x - y = -2$ and parallel to the line $3x + 2y + 5 = 0$ **(4)**

c) Find the equation of a straight line passing through midpoint of AB and midpoint of CD. Given A(2, 5), B(6, -1), C(1, 8) and D(3, 2). **(4)**

d) Find the equation of a circle concentric with the circle $2x^2+2y^2+8x+12y+10=0$ and passing through (-5, 1). **(4)**

e) Show that the line $12x+5y+24=0$ touches the circle $x^2+y^2-2x+4y+1=0$ **(4)**

Q.No.3. Sub question (a) is compulsory. Answer any three from (b), (c), (d), (e):

a) If $A+B = (\pi/3)^c$ and $A-B = 20°$ find A and B in degrees. **(3)**

b) If A and B are acute angle and $\sin A = 5/13$ and $\cos B = 4/5$, find $\sin(A+B)$ and $\cos(A+B)$. **(4)**

c) Solve the ΔABC, given a=12cm, b=10cm, c=15cm. **(4)**

d) Prove that $\frac{\sin 9x - \sin 3x}{\cos 7x + \cos 5x} = \sin 2x + \cos 2x.\tan x$ **(4)**

e) (i) Prove that $\frac{2\tan A}{1+\tan^2 A} = \sin 2A$ **(4)**

(ii) Find slope of the tangent to $y=x^3+4$ at (-2, -4).

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Q.No.4. Sub question (a) is compulsory. Answer any three from (b), (c), (d), (e):

a) Evaluate $\lim_{x\to 0}\frac{\cos 6x-\cos 4x}{x^2}$ **(3)**

b) Evaluate $\lim_{x\to 3}\frac{x-3}{\sqrt{4x-3}-\sqrt{2x+3}}$ **(4)**

c) Evaluate $\lim_{x\to 0}\frac{(e^{3x}-1)(1-\cos 8x)}{x^3}$ **(4)**

d) Find maxima and minima for the function $y=x^3-6x^2+9x+2$. **(4)**

e) The displacement of a particle at time t sec is given by $s=t^3+6t^2+2t+5$. When will the acceleration be 36 cm/sec^2? Find the displacement and velocity at that time. **(4)**

Q.No.5. Sub question (a) is compulsory. Answer any three from (b), (c), (d), (e):

a) Find $\frac{dy}{dx}$, if $y=x^3\tan x$ **(3)**

b) Find $\frac{dy}{dx}$, if (i) $y=(4x+5)^6$ (ii) $y=\log(\cos x)$ **(4)**

c) If $x^3+y^4+2x^2y^3=0$, find $\frac{dy}{dx}$. **(4)**

d) If $x=\cos^3\theta$, $y=\sin^3\theta$, then find $\frac{dy}{dx}$. **(4)**

e) If $y=(\cot x)^{3x+7}$, find $\frac{dy}{dx}$. **(4)**

Only for students of Rationalised scheme:

Q.No.6. Sub question (a) is compulsory. Answer any three from (b), (c), (d), (e):

a) Find x if (i) $\log_7\frac{1}{49}=x$ (ii) $\log_8 2=x$ (iii) $\log_2(x-2)+\log_2 4=3$ **(3)**

b) Find the volume of a pyramid having height 15cm whose base a hexagon of sides 6cm. **(4)**

c) Find the volume of frustum of pyramid with top and bottom faces as squares of sides 10cm and 6cm respectively. Height of the frustum is 18cm. **(4)**

d) Calculate the volume and curved surface of frustum of cone of height 12cm. The radii of top and bottom faces are 4cm and 9cm respectively. **(4)**

e) Calculate area by Simpson's rule where d (metres) is the ordinates at distance x (metres) **(4)**

x(m)	10	20	30	50	70	90	110
d(m)	3	5	10	12	8	4	2

Only for students of Revised scheme:

Q.No.6. Sub question (a) is compulsory. Answer any three from (b), (c), (d), (e):

a) Prove that $\sin^4A-\cos^4A=2\sin^2A-1$. **(3)**

b) Find the equations of tangent and normal to the circle $x^2+y^2-8x+10y+23=0$ at (1, -2). **(4)**

c) Differentiate $\sin^{-1}x$ with respect to $\sqrt{1-x^2}$. **(4)**

d) Evaluate $\lim_{x\to 0}\frac{18^x-6^x-3^x+1}{x^2}$ **(4)**

e) If $\cos B=\frac{\sin A}{2\sin C}$, show that ΔABC is isosceles. **(4)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2022 Examinations

Programme: **Engineering & Technology**

Subject: **Applied Chemistry (GC104)/(GN104) [Rat/Rev]**

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

Instructions: 1) Q.No.1 is compulsory. Answer any 4 from the remaining questions.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer the following Questions: **10x1.5=15**

a) For Principal Quantum number 'n'=3, write the possible values of 'l' (Azimuthal Quantum number) and m_l (magnetic quantum number).

b) State Pauli's Exclusion principle.

c) Write one equation for removal of temporary hardness of water by boiling.

d) Define hard and soft water.

e) Define electrolytic dissociation.

f) Why electrolytic solution as a whole is always neutral?

g) Which factors are essential for electrochemical corrosion to take place?

h) Small anodic area results in intense localised corrosion. Give reason.

i) Why galvanisation of article is preferred over tinning?

j) Write equation for polymerisation of vinyl chloride to polyvinyl chloride. **(only for students of Rationalised scheme)**

j) Define Saponification number of lubricant. **(only for students of Revised scheme)**

Q.No.2. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) Define Quantum numbers. State the significance of magnetic Quantum number. **(3)**

b) State octet rule. With the help of Hund's rule of maximum multiplicity, write the orbital electronic configuration of Phosphorous, Silicon and Neon. **(4)**

c) Explain the formation of magnesium oxide by electrovalency. **(4)**

d) Give four points of difference between ionic and covalent compounds. **(4)**

e) "Filling of 6p orbital takes place before 5f orbital". Justify the statement. **(4)**

Q.No.3. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) What are the causes of hardness in water? **(3)**

b) With reference to Zeolite process of water softening, answer the following questions: **(4)**

i) Write the formula of sodium zeolite.

ii) Write one reaction for removal of permanent hardness of water.

iii) Write one reaction for removal of temporary hardness of water.

iv) State one disadvantage of the process.

c) What is desalination of water? Explain the reverse osmosis process for desalination of brackish water. **(4)**

d) What are the disadvantages of using hard water in following industries: i) Sugar ii) Paper. **(4)**

e) i) Give two points of difference between sludge and scale. **(4)**
ii) Draw and label pH scale.

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Q.No.4. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) Schematically represent the process of electrolysis of fused NaCl using carbon electrodes. **(3)**

b) Explain the factors affecting degree of ionization. **(4)**

c) With reference to electrolysis of aqueous $CuSO_4$ solution using Pt electrodes, answer the following questions: **(4)**
- i) Write the ionization reactions.
- ii) Write the reaction at cathode and anode.
- iii) Why the pH of the solution decreases?

d) i) Give two points of differences between strong and weak electrolytes. **(2)**

ii) Define electrochemical series. Which of the following metals will displace H_2 gas from acid solution and why? **(2)**
Ag, Zn, Cu, Fe, Au

e) Explain the nature of different oxide films formed in oxidation corrosion. **(4)**

Q.No.5. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) State and explain the type of corrosion responsible for destruction of i) Steel pipeline connected to copper plumbing ii) Structures partially immersed in water. **(3)**

b) Explain the H2 gas evolution mechanism of electrochemical corrosion. **(4)**

c) Write brief notes on: **(4)**
i) Sacrificial anodic protection
ii) Impressed current cathodic protection

d) Explain the following methods of corrosion control by environment modification i) Dehumidification ii) Deactivation. **(4)**

e) Define concentration cell corrosion. Explain metal-ion concentration cell corrosion. **(4)**

Q.No.6. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e):

a) How corrosion can be controlled by i) using pure metals ii) using metal alloys. **(3)**

b) Describe the process of galvanising for protection of metals from corrosion. **(4)**

Only for the students of Rationalised scheme:

c) Differentiate between thermoplastic and thermosetting plastic giving four points. **(4)**

d) Explain the following properties of synthetic rubber: i) Hardness ii) Rebound **(4)**

e) State any four drawbacks of natural rubber. Why it is necessary to vulcanise natural rubber? **(4)**

Only for the students of Revised scheme:

c) Explain the mechanism of fluid film lubrication. **(4)**

d) Explain the following properties of lubricants: **(4)**
- i) Cloud point and pour point
- ii) Acidity

e) How lubricants are classified? Write a brief note on solid lubricants. **(4)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2022 Examinations

Programme: **Engineering & Technology**

Subject: **Applied Physics-II (GC202) [Rat]**

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

Instructions: 1) Q.No.1 is compulsory. Answer any 4 from the remaining Questions.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer the following Questions: **10x1.5=15**

a) Define electric Intensity.
b) The potential difference between the plates of the capacitor of capacitance 0.5μF is 150V. Calculate charge on the plate.
c) Give 2 examples for heating effect of electric current.
d) Define Internal resistance of a cell.
e) State Right hand thumb rule.
f) What is a transformer?
g) Give 2 uses of infrared light.
h) State 2 applications of total internal reflection.
i) What are Ultrasonic wave?
j) Define i) Wave length ii) Frequency.

Q.No.2. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e), (f):

a) Define i) Absolute potential ii) Capacitance **(3)**
b) State coulomb's law of electrostatics. Write an expression and explain. **(4)**
c) Obtain an expression for effective capacitance when two capacitors are connected in series. **(4)**
d) Two capacitors 0.3F and 0.5F are connected in parallel and charged with 200C. Find i) Effective capacitance ii) Potential iii) Charge on each capacitor. **(4)**
e) Calculate electric Intensity at a point 50cm from a charge of 4.8 micro coulomb in a medium of dielectric constant 2.8. **(4)**
f) State and explain the factors on which resistance of a conductor depends on. Define specific resistance. **(4)**

Q.No.3. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e), (f):

a) i) Define specific resistance. **(3)**
ii) State ohm's law.
b) Three resistance 4Ω, 8Ω and 12Ω are connected in (i) series (ii) parallel. Find the effective resistance in each case. **(4)**
c) Explain how to determine unknown resistance using meter bridge and draw circuit diagram. **(4)**
d) The resistance of write is 5Ω at 30°C. Determine its resistance at 100°C. Temperature coefficient of resistance = $3.92 \times 10^{-3}/°C$. **(4)**
e) An electric Iron is marked 250V and 750W. What current does it take and what is it's resistance? If the Iron is used for 2 hours daily, what is the energy bill for 30 days at Rs.2/- per unit? **(4)**
f) State and explain Joule's law of electrical heating. An electric iron of resistance 25Ω takes 4A current. Calculate heat developed in joules in 30s. **(4)**

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Q.No.4. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e), (f):

a) i) Define magnetic field. (3)
ii) What is step up transformer?

b) State Faraday's laws of electromagnetic Induction. (4)

c) State the principle of Induction heating. Give 2 applications of Induction heater. (4)

d) Find the current passing through a wire of length 0.2m, when kept in a magnetic field of strength 0.045 wb/m^2 at an angle of 30° with the direction of the field experiencing force of 0.03N. (4)

e) Explain mutually induced emf with the help of diagram. (4)

f) The magnetic flux associated with the coil of 100 turn charges from 50 x 10^{-5} wb to 25 x 10^{-5} wb in 0.02s. Calculate induced emf. (4)

Q.No.5. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e), (f):

a) State laws of refraction. (3)

b) What is LASER? State 2 source and 2 applications. (4)

c) Draw and explain production of X rays by Coolidge tube. (4)

d) State 4 important properties of X-rays. (4)

e) Explain refraction through prism with diagram. What is angle of deviation? (4)

f) A lamp of 16 cd is placed at a distance of 1.4m from a lamp of 100cd. Fine the position of the screen to be placed between them so that it is equally illuminated on both sides. (4)

Q.No.6. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e), (f):

a) Define i) free vibration ii) forced vibration. (3)

b) Explain what is piezoelectric effect and production of ultrasonic waves using it. (4)

c) Explain with diagram detection of flaws in metal using ultrasonic waves. (4)

d) Explain echo and reverberation of sound. (4)

e) Define resonance. State two examples in which resonance should be avoided. (4)

f) The balancing length of a potentiometer wire for a cell is 80cm when the cell is in the open circuit. When a resistance of 2Ω is included in the circuit the balancing length becomes 32cm. Calculate internal resistance of the cell.

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