BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2023 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 four 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) List any three physical properties of engineering materials.
b) Mention carbon percentage of i) Low carbon steel ii) Medium carbon steel iii) High carbon steel.
c) Write the classification of rocks.
d) Write any three applications of refractories.
e) Write any three characteristics of good insulating material.
f) Define following chemical properties: i) Corrosion resistance ii) Chemical composition.
g) Mention any three constituents of paints. **(only for the students of Rationalised scheme)**
g) Write any two sources and any two uses of Lime. **(only for the students of Revised scheme)**

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

a) Define following mechanical properties of engineering materials: i) Elasticity ii) Ductility. (3)
b) Write short note on following constituents of alloy steels and their effects on properties of materials: i) Sulphar ii) Phosphorous. (6)
c) What are grey cast iron and white cast iron? Write any two applications of Grey cast Iron and any two applications of White cast iron. (6)
d) Write short note on composition, properties and uses of Tool steel. (6)

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

a) What are the different sources of sand? (3)
b) Write a short note mentioning the properties and uses of Copper and Aluminium. (6)
c) Write a short note on any two types of cements. Mention their composition and uses. (6)
d) Write short notes on i) Borosilicate glass ii) Fibre glass. (6)

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

a) Write atleast two properties and two uses of 'special bricks'. (3)
b) State any two properties and two uses of following materials i) Nichrome ii) Constantan iii) Manganin. (6)
c) Write a short note on any six varieties of timber and their uses. (6)
d) Write atleast two characteristics and two applications of following solid insulating materials: i) wood ii) Mica iii) PVC. (6)

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

a) Differentiate between metal and non-metal. (3)

b) Write a short note on properties and applications of i) Bronze ii) Duralumin. (6)

c) List and define any three electrical properties of engineering materials. (6)

d) Write short notes on following semiconductor materials: i) Silicon ii) Germanium. (6)

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

a) List any three high resistivity materials. (3)

b) How magnetic materials are classified? State three types of magnetic materials and mention atleast one application of each of them. (6)

Only for the students of Rationalised scheme:

c) Write a short note on types of reinforcement materials and their applications. (6)

d) List any three types of lubricants. State their composition and applications. (6)

Only for the students of Revised scheme:

c) Write short note on Liquid insulating materials. (6)

d) Write a short note on vulcanization process. (6)

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Env.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2023 Examinations

Programme: **Common**

Subject: **Environmental Studies (GC203)**

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

Instructions: 1) Q.No.1 is compulsory. Answer any four 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 environmental studies. Why there is need for public awareness on environment issues?
b) Write a brief note on ecological succession.
c) State any three guidelines for sustainable development.
d) State the importance of forest resource.
e) What are the sources of nuclear pollution?

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

a) Write a note on environmental ethics. **(3)**
b) Describe the ex-situ method of conservation of biodiversity. **(6)**
c) i) Write a note on types of food chain. **(3)**
ii) Explain pyramid of number giving a suitable example. **(3)**
d) Describe grassland ecosystem. **(6)**

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

a) Define the following terms: i) Endangered species ii) Threatened species iii) Food web. **(3)**
b) Explain the environmental impacts of mining activities. **(6)**
c) Why there is need for conservation of water? Briefly explain the types of rainwater harvesting methods. **(6)**
d) Write brief notes on: **(6)**
i) Eutrophication ii) Overgrazing & its effects

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

a) What are renewable and non-renewable sources of energy? Give examples of each. **(3)**
b) State the benefits and drawbacks of dams. **(6)**
c) Describe any two methods of solid waste disposal. **(6)**
d) Explain the causes and effects of water pollution. **(6)**

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

a) Write a brief note on green house effect and global warming. **(3)**
b) Describe the role of an individual in prevention of pollution. **(6)**
c) Explain the effect of thermal pollution on aquatic life. **(6)**
d) i) Write a note on effects of consumerism on environment. **(3)**
ii) State the control measures of noise pollution. **(3)**

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

a) State any six human rights. **(3)**
b) Define Environmental Impact Assessment. Briefly explain the process and objectives of Environmental Impact Assessment (EIA). **(6)**
c) Describe the role of information technology in environment. **(6)**
d) State the functions of central and state pollution control boards under Water (Prevention & Control of Pollution) Act. **(6)**

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c) Explain the role of Information Technology in environment and human health. **(Only for students of Rationalised scheme)**

c) What are the environmental assets in the state of Goa? What threats have you observed to these assets? **(Only for students of Revised scheme)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2023 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 four 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) Find x if $\begin{vmatrix} x & 3 \\ x & 4 \end{vmatrix} = \begin{vmatrix} 1 & 2 \\ 2 & 4 \end{vmatrix}$

b) Find AB if A= $\begin{bmatrix} 1 \\ 2 \end{bmatrix}$ & B = [3 4]

c) $\int (\sin(2x) - 3^x + x^7)dy$

d) Find $\bar{a} \times \bar{b}$ if $\bar{a} = i + j - k$, $\bar{b} = i + 2j + k$

e) Find Mean, Median, Mode of 15, 18, 20, 22, 18, 17, 21, 16. **(only for students of Mechanical Engg. & Allied courses)**

e) Find $|z_1 z_2|$ if $z_1 = 3 - 4i$ & $z_2 = 1 + i$ **(only for students of Electronics Engg. & Allied courses)**

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

a) Find x, y, z if $\begin{bmatrix} x+y & y-1 \\ 0 & z+2 \end{bmatrix} = \begin{bmatrix} 4 & 5 \\ 0 & 6 \end{bmatrix}$ **(3)**

b) Solve by Cramer's Rule **(4)**
x-y+z=2, 2x+y-z=1, x+2y+z=8

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

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

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

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

a) $\int \frac{1}{x \log x} dx$ **(3)**

3 x 4 = 12

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

e) $\int_0^6 \frac{\sqrt{x}}{\sqrt{x} + \sqrt{6-x}} dx$

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

a) Check whether vector $\bar{a} = 2i + 3j + k$ is perpendicular to $\bar{b} = 4i - 2j - 2k$. **(3)**

b) Find projection of $\bar{a}$ on $\bar{b}$ if $\bar{a} = 2i - j - k$ and $\bar{b} = i + j + 2k$. **(4)**

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c) Find unit vectors perpendicular to $\bar{a} = 2i - 6j - 3k$ and $\bar{b} = 4i + 3j - k$. (4)

d) Find value of 'p' if vectors $\bar{a} = i + pj - 7k$, $\bar{b} = 2i - 5j + 13k$, $\bar{c} = 3i + j - 6k$ are coplanar. (4)

e) Find volume of parallelopip having coterminus edges $\bar{a} = i - 2j - k$, $\bar{b} = 3i + 2j + k$, $\bar{c} = i + j + 5k$. (4)

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

a) $\int_0^2 x(x^2 - 1)dx$ (3)

b) $\int \frac{\cos x}{9 - \sin^2 x} dx$ c) $\int \frac{e^x}{1 + 3e^x} dx$ d) $\int \log x dx$ **3 x 4 = 12**

e) Find volume generated by revolving area enclosed by $y^2=3x+1$, $x=0$, $x=2$ about X-axis.

Only for students of Mechanical Engg. & Allied courses:

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

a) Find area under the curve $y=4x^2$, $x=0$, $x=2$ and x-axis using Integration. (3)

b) Find Median & Mode (4)

Class interval	0-4	4-8	8-12	12-16
Frequency	8	11	15	6

c) Find Mean deviations (4)

Class mark	6	12	18	24	30
Frequency	2	5	8	7	3

d) Calculate standard deviation of 11, 14, 17, 16, 15, 20, 21. (4)

e) Arithmetic mean of 20 items is 62.3. If 2 items of values 58 & 85 are removed from data, find correct Mean of 18 items. (4)

Only for students of Electronics Engg. & Allied courses:

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

a) Express in the form $a + ib$: $\frac{(1+i)(1-i)}{i^{10} + i^{18}}$ (3)

b) Simplify using De Moivre's theorem **3 x 4 = 12**

$$\frac{(\cos 5\theta - i \sin 5\theta)(\cos \theta + i \sin \theta)^2}{(\cos 3\theta + i \sin 3\theta)^2 (\cos \theta - i \sin \theta)^2}$$

c) Solve using complex numbers $x^3=1$.

d) If $z_1 = 1 + 2i$, $z_2 = 3 - 4i$ find (i) $\frac{z_1}{z_2}$ (ii) $3z_1 - z_2$

e) (i) Find value of a & b if 2a+5+bi = 3-4i

(ii) Express into polar form $\sqrt{3} + i$

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2023 Examinations

Programme: **Engineering & Technology**

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

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

Instructions: 1) Q.No.1 is compulsory. Answer any four 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:

a) Find the equation of a line passing through (2, 1) and having slope 1/3. **(2)**

b) Find the arc length and area of sector of a circle with radius 5 cms, if the arc subtends an angle 20° at the centre of circle. **(2)**

c) Evaluate $\lim_{x\to 4}\frac{x^2-5x+4}{x-4}$ **(2)**

d) Find $\frac{dy}{dx}$ if $y=\sec x-x^3+2^x-\frac{2}{x}$ **(2)**

e) Solve the quadratic equation $x^2-23x+112=0$. **(2)**

f) Divide the polynomial $x^4-5x^3+12x^2-10x-3$ by $x-1$. **(3)**

g) Find the volume of pyramid whose base is an equilateral triangle of side 12cms and the height of prism is 22cms. **(2)**

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

a) Find the slope, X intercept, Y intercept of a line $3x+4=2y$. **(3)**

b) Find the equation of a line perpendicular to the line $x+5y=6$ and passing through the point (4, -6) **(4)**

c) Find the equation of line passing through point (2, 5) and through the midpoint of segment AB where A(1, 4) and B(3, -6). **(4)**

d) Find the equation of circle which is concentric with circle $x^2+y^2-8x+4y+6=0$ and passing through the point (7, 2). **(4)**

e) Find whether the line $3x+2y-6=0$ touches the circle $x^2+y^2-6x+8y=0$. **(4)**

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

a) Convert the following angles into radians: **(3)**
15°, -420°, 100°

b) If A and B are acute angles such that $\sin A=\frac{1}{\sqrt{2}}$ and $\cos B=\frac{\sqrt{3}}{2}$, **(4)**
find (i) $\sin(A+B)$, $\cos(A+B)$ (ii) state the quadrant of $A+B$.

c) In ΔABC prove: **(4)**
(i) acosC + ccosA = b (ii) (a-b) sinC + (b-c) sinA + (c-a) sinB = 0

d) If tan A = ½ , tan B = ¾ find tan(2A+B). **(4)**

e) Prove $\frac{\cos 3A-\cos 5A}{\sin 3A+\sin 5A}=\tan A$ **(4)**

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

a) Evaluate $\lim_{x\to 2}\left[\frac{1}{x-2}-\frac{2}{x(x^2-3x+2)}\right]$ **(3)**

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b) Evaluate $\lim_{\theta \to 0} \frac{1-\cos 4\theta}{1-\cos 6\theta}$ **(4)**

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

d) Find the maximum and minimum values of the function $y=x^3-12x$. **(4)**

e) The displacement of a particle at time 't' is given by $s=5+6t^2-t^3$ cms. **(4)**

i) When does acceleration become zero?

ii) Find the displacement and velocity at that time.

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

a) Find $\frac{dy}{dx}$ if $y = \sin 3x \cdot e^{2x}$ **(3)**

b) Find $\frac{dy}{dx}$ if i) $y = \frac{\sin 2x}{\log 5x}$ ii) $y = a^{\tan 2x}$ **(4)**

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

d) Find $\frac{dy}{dx}$ if $x = \sin^4 \theta$, $y = \cos^4 \theta$ **(4)**

e) Find $\frac{dy}{dx}$ if $y = (\cos x)^{3x}$ **(4)**

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

a) (i) Prove $\log\left(\frac{145}{49}\right) + \log\left(\frac{14}{29}\right) - \log\left(\frac{10}{7}\right) = 0$ **(3)**

(ii) If $\log x + \log (x-1) = \log 6$, find 'x'.

b) Find the lateral surface area and volume of triangular prism whose base is an equilateral triangle of side 8cms and the height of prism is 12cms. **(4)**

c) Find curved surface area of frustum of a cone whose top and bottom radii are 4cms and 9cms and height is 12cms. **(4)**

d) If the frustum of a pyramid has sides of top square and bottom square 12cms & 40cms and height of the frustum is 10cms. Find the volume of the frustum. **(4)**

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

x(m)	0	10	20	30	35	40	45	50	70	90
d(m)	2	5	12	15	14	10	8	5	3	4

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2023 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 four 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) What is the significance of Azimuthal quantum number?
b) State the magnetic quantum number values of p-orbitals.
c) What are the disadvantages of using hard water for washing clothes?
d) Define PH.
e) What are strong and weak electrolytes?
f) Define Degree of Ionization.
g) Why do partially immersed structures corrode below the water line?
h) Why galvanized articles should not be used to cook acidic food items?

Only for students of Rationalised scheme:

i) State three drawbacks of natural rubber.
j) What are thermosetting plastics?

Only for students of Revised scheme:

i) What type of lubricants should be selected for high pressure and low speed machines?
j) Give one example each of solid, semi-solid and liquid lubricant.

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

a) On the basis of Aufbau principle explain why 6s subshell is filled before 4f subshell. **(3)**
b) State Hund's Rule. Write orbital electronic configuration for the following elements: **(4)**
(i) Nitrogen (ii) Aluminium iii) Clorine
c) Explain the formation of Ozone molecule. **(4)**
d) Distinguish between electrovalent and covalent compounds. **(4)**
e) Distinguish between Orbit and Orbital. **(4)**

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

a) Explain the process of electro dialysis for desalination of brackish water. **(3)**
b) Discuss the disadvantages of scale & sludge formation in boilers. **(4)**
c) With reference to Zeolite process of water softening, answer the following: **(4)**
(i) Write chemical composition of Zeolite.
(ii) Write one reaction for removal of temporary hardness.
(iii) Write one reaction for removal of permanent hardness.
(iv) Why acidic water should not be passed through Zeolite?
d) With reference to Ion Exchange process of water softening answer the following: **(4)**
(i)Write the reaction for removal of $CaSO_4$ from Hard water.
(ii) Write one reaction each for the regeneration of exhausted cation and anion exchange resin.
e) Explain the disadvantages of using hard water in (i) Paper Industry (ii) Sugar Industry. **(4)**

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

a) Give the schematic representation of electrolysis of molten Sodium Chloride using Graphite electrodes. **(3)**

b) With reference to electrolysis of ageous $CuSO_4$ using platinum electrodes answer the following: **(4)**
(i) Write Ionization reactions.
(ii) Write reactions at Cathode and Anode.
(iii) Why does solution become colourless at the end of electrolysis?

c) Discuss the factors affecting degree of Ionization. **(4)**

d) State the significance of Electrochemical series. **(4)**

e) Write the reaction and state the applications of the product formed: (i) Polymerization of Styrene (ii) Polymerization of Tetrafluro ethylene. **(only for students of Rationalised scheme)** **(4)**

e) Explain the following properties of lubricants: (i) Viscosity Index (ii) Fire Point (iii) Pour Point (iv) Saponification value. **(only for students of Revised scheme)** **(4)**

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

a) State the factors essential for electrochemical corrosion to take place. **(3)**

b) Explain the type of oxide films in oxidation corrosion. **(4)**

c) With a suitable example explain Hydrogen Evolution Mechanism of Electrochemical Corrosion. **(4)**

d) State the principles of proper designing for corrosion control. **(4)**

e) Explain the process of Galvanizing. **(4)**

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

a) State any three properties and related applications of synthetic rubber. **(only for students of Rationalised scheme)** **(3)**

a) State the functions of a lubricant. **(only for students of Revised scheme)** **(3)**

b) With suitable example explain impressed current cathodic protection method. **(4)**

c) Discuss the following methods of corrosion control: **(4)**
(i) Deactivation (ii) Dehumidification

d) With a neat labelled diagram explain Galvanic cell corrosion. **(4)**

e) Explain the process of Metal Spraying **OR** powder coating for control of corrosion. **(4)**

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April 23
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Physics

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2023 Examinations

Programme: **Engineering & Technology**

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

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

Instructions: 1) Q.No.1 is compulsory. Answer any four 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) State SI unit of energy and force.
b) What are fundamental units?
c) Give two examples of scalar quantity.
d) What is potential energy?
e) Define angular velocity. State its SI unit.
f) Why curved roads are banked?
g) State Hooke's law.
h) What is adhesive force?
i) State Boyle's law.
j) Define coefficient of thermal conductivity.

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

a) State all the fundamental quantities, their units and symbols of SI system. **(3)**
b) Obtain dimensional formula of: (i) Acceleration (ii) Density. **(4)**
c) Check the correctness of the equation $T = \frac{rh\rho g}{2}$ using dimensions. T is surface tension, r is radius, h is height, ρ is density & g is acceleration due to gravity. **(4)**
d) What are errors? Explain systematic error with examples. **(4)**
e) Explain positive and negative zero error in case of Vernier calipers. **(4)**
f) Define: (i) Uniform velocity (ii) Acceleration due to gravity. **(4)**

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

a) State 3 differences between speed and velocity. **(3)**
b) Classify the following into scalars and vectors: (i) Time (ii) Velocity (iii) Volume (iv) Temperature (v) Acceleration (vi) Energy. **(4)**
c) A train travels at a speed of 54 km/hr. When it is 50m away from an obstacle the driver applies brakes. What is the minimum retardation so that train avoids collision? **(4)**
d) A body is thrown vertically up with a velocity of 30 m/s. Find the distance covered in 5 seconds. **(4)**
e) A body of mass 30 kg is at a height 12m above the ground level and is moving with a velocity of 1.2 m/s. Calculate kinetic energy and potential energy of the body. **(4)**
f) Define: (i) Centripetal force (ii) Tangential velocity. **(4)**

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

a) What is a satellite? Explain uses of communication satellites. **(3)**
b) A stone of mass 0.05 kg is whirled by a string in a horizontal circle of radius 0.6 m completing 80 rpm. Find tension along the string. **(4)**
c) A car is moving on a circular track of 150m radius and banking angles of 30°. To avoid the chances of skidding, what should be the speed of the car? **(4)**

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d) State and explain Newton's law of gravitation. (4)

e) Define escape velocity. Write an expression for escape velocity. Calculate escape velocity on the surface of earth. Given: Radius of earth= 6.4×10^6m, Mass of earth= 6×10^{24} kg, G= 6.67×10^{-11} Nm^2/kg^2. (4)

f) Define surface tension. State two applications of surface tension. (4)

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

a) Define: (i) Young's modulus (ii) Bulk modulus. (3)

b) A load of 3.5 kg is attached to the lower end of steel wire of length 3m of radius 0.75 mm. Calculate extension produced in the wire. Take Y = 2×10^{11} N/m^2. (4)

c) (i) Define angle of contact. (2)
(ii) Explain capillary rise. (2)

d) A liquid rises through a height of 6cm in a capillary tube of radius 0.4mm. How far will it rise in a capillary tube of radius 0.95 mm? (4)

e) (i) Define force of viscosity. (2)
(ii) What are streamline and turbulent flow? (2)

f) A metal plate of area 0.25 m^2 rests on a layer of oil of thickness 3mm. Coefficient of viscosity of oil is 1.56 Ns/m^2. Find force necessary to move the plate with velocity of 0.05m/s. (4)

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

a) State and explain Charle's law. (3)

b) Define conduction. Explain conduction of heat along metal rod. What is steady state? (4)

c) Explain linear expansion of solids with heat. Write an expression and explain terms. (4)

d) State and explain two engineering applications of expansion of solids. (4)

e) (i) Define Latent heat of fusion. (2)
(ii) Write general gas equation and explain the terms. (2)

f) A glass sheet of area 2 m^2 has a thickness of 2mm. Its opposite faces are at temperature 25°C and 10°C respectively. If the coefficient of thermal conductivity of glass is 2×10^{-4} Kal/m°Cs, find the quantity of heat conducted in 10 seconds. (4)

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