BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 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 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) Differentiate between metals & Non-metals.
b) State any three important uses of the medium carbon steel.
c) What are Abrasives? Give two applications.
d) List down the important characteristics of good conductor materials.
e) What is 'Brass'? Mention the various kinds of brasses used in engineering applications.
f) State any three features of Diamagnetic materials. **(only for the students of Rationalised scheme)**
f) Write down the chemical composition of portland cement. **(only for the students of Revised scheme)**

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

a) Define any three mechanical properties of materials. (3)
b) State & define chemical & magnetic properties of materials. (6)
c) List down any six properties of copper. (6)
d) What are the effects of the following elements on steel? (6)
i) Silicon ii) Sulphur iii) Manganese

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

a) List down any three important properties of white cast iron (3)
b) Sate the properties & uses of: (6)
i) Aluminium Bronze ii) Y alloy
c) Sate the properties & the uses of Glass wool. (6)
d) Mention the properties & uses of the following types of rubbers: i) Butyl Rubber ii) Neoprene Rubber. (6)

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

a) Describe how bricks are classified. **(only for the students of Rationalised scheme)** (3)
a) Why we have to study engineering materials. **(only for the students of Revised scheme)** (3)
b) State any four characteristics and two uses of Tungsten material. (6)
c) Sate any four properties & two uses of i) Aluminium ii) Copper as conducting materials. (6)
d) Write down the characteristic of good Building stones. (6)

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

a) Write short note on uses of cement. (3)
b) Mention the properties & uses of any three types of

Only for the students of Rationalised scheme:

c) Explain the types of Lubricants with their composition & applications. (6)

d) Explain the polymer matrix composites material. (6)

Only for the students of Revised scheme:

c) Explain the four steps involved in manufacturing of bricks. (6)

d) Stet any four properties & two of following: (6)
i) Veneer ii) Plywood (6)

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

a) Give three characteristics of Refractory materials. **(only for the students of Rationalised scheme)** (3)

a) What are semiconductors? Give two applications of semiconductors. **(only for the students of Revised scheme)** (3)

b) Tool Steel (4)

c) Constituents of Bricks (4)

d) Silicon as semiconductor (4)

e) Ceramic matrix material **(only for the students of Rationalised scheme)** (4)

e) Fire clay Refractory **(only for the students of Revised scheme)** (4)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2022 Examinations

Programme: **Engineering & Technology**

Subject: **Engineering Maths-II (GC201)/(GN201) [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) Given $\begin{bmatrix} a & 3 \\ 5 & b \end{bmatrix} + \begin{bmatrix} 7 & -1 \\ 2 & 3b \end{bmatrix} = \begin{bmatrix} 1 & c \\ 7 & 2 \end{bmatrix}$, find a, b, c.

b) Find x if $\begin{vmatrix} 2x & 1 \\ 4 & 3 \end{vmatrix} = \begin{vmatrix} 3 & 1 \\ 4 & 2 \end{vmatrix}$

c) $\int (3^x + \cos 3x - 2)dx$

d) Find the mean, median, mode of 5, 1, 3, 2, 5, 4, 8. **(only for Mechanical Engg. & allied courses)**

d) Find $\frac{z_1}{z_2}$ where $z_1 = 3+i$, $z_2 = 2-i$. **(only for Electronics Engg. & allied courses)**

Only for students of Rationalised scheme:

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

f) Find $(\bar{a} + \bar{b}) \cdot \bar{c}$ given $\bar{a} = \bar{i} + \bar{j} + \bar{k}$, $\bar{b} = 2\bar{i} - \bar{j} + \bar{k}$, $\bar{c} = \bar{i} + 3\bar{j} + \bar{k}$.

Only for students of Revised scheme:

e) State the order & degree of the D.E. $y = \frac{dy}{dx} + \left(\frac{dy}{dx}\right)^2$.

f) Obtain the middle term in the expansion of $(1+x)^6$.

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

a) Find the value of k if the matrix $A = \begin{bmatrix} 7 & k \\ 3 & 3 \end{bmatrix}$ is singular. **(3)**

b) Use Cramer's rule to solve the equations: **(4)**
2x+y+3z=11, x-y+z=2, 3x+2y-z=12

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Only for Electronics Engg. & allied branches:

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

a) Given $z_1 = 3+4i$, $z_2 = 6-2i$, then find $|2z_1 + 3z_2|$. **(3)**

b) If $\frac{3i^{15} - 2i^6 + 4i}{1+i} = a + ib$, find the value of a & b. **(4)**

c) Use De Moivre's theorem to simplify **(4)**

$$\frac{(\cos 2\theta - i\sin 2\theta)^{1/2}(\cos 5\theta + i\sin 5\theta)^{2/5}}{(\cos\theta - i\sin\vartheta)\left(\cos\frac{\theta}{2} + i\sin\frac{\theta}{2}\right)^4}$$

d) Find $\sqrt[3]{i}$ **(4)**

e) Separate cos (x-iy) into its real and imaginary parts. **(4)**

Only for students of Rationalised scheme:

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

a) Find a vector perpendicular to both the vectors $\bar{a} = \bar{i} + \bar{j} + \bar{k}$ and $\bar{b} = 2\bar{i} + \bar{j} + \bar{k}$. **(3)**

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

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

d) Find the area of a triangle ABC with vertices A(-1, 2, -1), B(-2,1,1), C(-1, 2, 3). **(4)**

e) Given $\bar{a} = \bar{i} + \bar{j} + \bar{k}$, $\bar{b} = 2\bar{i} - \bar{j} + \bar{k}$, find the projection of $\bar{a} + \bar{b}$ on $\bar{a}$. **(4)**

Q.No.6. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e): **(3 + 3x4)**

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

d) $\int x\cos 2x dx$

e) Find the area between the line y=4x+1, the X-axis, x=0, x=2.

Only for students of Revised scheme:

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

a) Obtain the general solution of the differentiate equation $\frac{dy}{dx} = 6 - 3x$. **(3)**

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c) Find the inverse of the matrix $A=\begin{bmatrix}1 & 3 & 3\\ 1 & 4 & 3\\ 1 & 3 & 4\end{bmatrix}$. (4)

d) If $A=\begin{bmatrix}5 & 1\\ 2 & 3\end{bmatrix}$, find $A^2+3A-4I$. (4)

e) Use the matrix method to solve the equations: (4)
$4x-y=22,\ 3x+2y=11$

Q.No.3. Sub question (a) is compulsory. Answer any 3 from (b), (c), (d), (e): (3 + 3x4)

a) $\int\left(\frac{1}{2x-1}+e^{-5x}\right)dx$ b) $\int\frac{1}{\sqrt{x+2}+\sqrt{x+5}}\,dx$ c) $\int\frac{e^x}{e^{2x}+9}dx$

d) $\int_5^6\frac{\sqrt{x-6}}{\sqrt{x-6}+\sqrt{5-x}}dx$ e) $\int_0^1 xe^x dx$

Only for Mechanical Engg. & allied branches:

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

a) The arithmetic mean of a sample of 10 items is 45. If two more items with values 41 and 46 are added to the sample, find the new arithmetic mean. (3)

b) Calculate the mean and the mean deviation of the marks out of 10 given below for 20 students. (6)

Marks (x_i)	3	4	5	6	7	8
Number of students	1	3	7	5	2	2

c) Find the standard deviation of the following distribution. (6)

Class interval	20-40	40-60	60-80	80-100	100-120	120-140
frequency	6	9	11	14	20	15

Only for students of Rationalised scheme:

d) Calculate the median and mode of the following data related to the weight of 120 articles. (6)

Weight (Kg)	0-10	10-20	20-30	30-40	40-50	50-60
No. of articles	12	15	20	24	21	16

Only for students of Revised scheme:

d) Use Partial fractions to find $\int\frac{3x-2}{x(x+1)(x+2)}dx$ (6)

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b) Find the particular solution of the differential equation $\frac{dy}{dx} = x + 4$, given y=0 when x=0. **(4)**

c) The acceleration of a moving particle at the end of 't' seconds from the start of motion is 5-2t m/s^2. Find its velocity at the end of 3 seconds, given its initial velocity is 4 m/s. **(4)**

d) Expand $(1-2x)^4$ using the Binomial theorem. **(4)**

e) Find the 8^{th} term in the expansion of $(2x+y)^{10}$. **(4)**

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

a) Calculate the volume of a prism of height 24cms, whose base is an equilateral triangle of sides 2cm. **(3)**

b) Calculate the volume of a pyramid whose base is a pentagon of sides 12cm. The height of the pyramid is 15cm. **(4)**

c) A water tank 50m high has its two ends as circles with diameters 30m & 24m. Find the volume of water it can hold. **(4)**

d) Using Simpsons $1/3^{rd}$ rule to calculate the area of cross section of a tunnel from the table given below. **(4)**

Distance from one end (m)	0	5	10	15	20	30	40
Depth (m)	15	16	18	19	17	14	12

e) Find the coefficient of x^7 in the expansion of $\left(x^3 + \frac{1}{x^2}\right)^4$. **(4)**

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 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 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 the equation of a line passing through the point (2,-3) and having a slope $5/6$.

b) If $2A+B=120^\circ$ and $A-B=\frac{\pi^c}{6}$ find A and B in degrees.

c) Find $\frac{dy}{dx}$ if $y=(x^2+1)^2$.

Only for students of Rationalised scheme:

d) Find the volume of a Pyramid with square base of length 16cm and slant height of the pyramid is 10cm.

e) Divide x^3-3x+4 by $x-2$.

Only for students of Revised scheme:

d) Find area of △ABC with vertices A(2,1), B(4,6) and C(2,7).

e) Evaluate $\lim_{x\to 0}\frac{\sin 5x \sin 2x}{x^2}$

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

a) Find the equation of a circle whose diameter is a line joining (1, 5) and (-3, 6). **(3)**

b) Find the equation of median AD of △ABC with A(4,2), B(-3,1) and C (5, 7). **(4)**

c) Find the angle between the lines $2x+y+4=0$ and $3x-y+5=0$. **(4)**

d) Show that the circles $x^2+y^2-4x-12y+31=0$ and $x^2+y^2-16x+4y+19=0$ touch each other. **(4)**

e) Find the equation of a circle having centre (4, 7) and touches the line $3x+4y-10=0$. **(4)**

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

a) If $\sin\theta=\frac{-5}{13}$ and θ lies in 4th quadrant. Find cosθ, tanθ and cosecθ. **(3)**

b) Prove that $\tan(45+\theta)=\frac{\cos\theta+\sin\theta}{\cos\theta-\sin\theta}$. **(4)**

c) Prove that $\frac{\sin 6\theta-\sin 2\theta}{\cos 6\theta-\cos 2\theta}=-\cot 4\theta$. **(4)**

d) In a △ABC, if a=10cm, A=50° and C=60°. Solve the triangle ABC. **(4)**

e) Evaluate $\lim_{x\to 0}\frac{14^x-7^x-2^x+1}{x^2}$ **(4)**

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

a) Evaluate $\lim_{x\to 2} \frac{x^2+2x-8}{x^2-7x+10}$ (3)

b) Evaluate $\lim_{x\to 0} \frac{\sqrt{x+3}-\sqrt{3-x}}{x}$ (4)

c) Find the equations of tangent and normal to $y=x^3-2x^2+3x+4$ at (1,6). (4)

d) The displacement of a particle in time 't' seconds is given by $s=t^3-3t^2+6t+1$. When does the acceleration becomes 18 cm/sec^2? Find the velocity at that time. (4)

e) Find the maxima and minima for the function $y=x^3-9x^2+24x+3$. (4)

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

a) Find $\frac{dy}{dx}$ if $y=(\sin 4x)^3$. (3)

b) Find $\frac{dy}{dx}$ if (i) $y=x^2e^x$ (ii) $y=\frac{\cos x}{x}$. (4)

c) Find $\frac{dy}{dx}$ if $2x^2+3y^2+4xy^3=0$. (4)

d) Find $\frac{dy}{dx}$ if $x=\tan 2t$, $y=\sec 2t$. (4)

e) Find $\frac{dy}{dx}$ if $y=(\cot x)^x$. (4)

Only for students of Rationalised scheme:

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

a) Solve and state the nature of roots of $3x^2-4x+5=0$. (3)

b) Find x if (i) $\log_3(x+2)=2$ (ii) $\log_2 5+\log_2(x-2)=2\log_2 10$. (4)

c) Find the volume of frustum of a pyramid 12cm high, top and bottom faces are hexagons of sides 4cm and 6cm respectively. (4)

d) Find the curved surface of frustum of a cone if radii of top and bottom faces are 6cm and 18cm respectively. Height of the frustum is 5cm. (4)

e) A series of offsets measured from a survey line to the curved boundary of the plot. (4)

Distance from one end to survey line in metres	6	12	18	33	48	63	78
Offsets (in metres)	2	7	9	14	12	6	1

Find area of the plot using Simpson's rule.

Only for students of Revised scheme:

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

a) Find x, if distance between A(x, 4) and B (1, 7) is 5. (3)

b) Prove that $\cos 2A=\frac{1-\tan^2 A}{1+\tan^2 A}$. (4)

c) In a ABC, prove that $\frac{\sin(B-C)}{\sin A}=\frac{b^2-c^2}{a^2}$. (4)

d) Differentiate $x^2\sec x$ with respect to $\tan x$. (4)

e) Find equations of tangent and normal to the circle $X^2+y^2-4x+6y+11=0$ at (1, -2). (4)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 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 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) How many orbitals are there in M shell? Which are they?
b) When is an atom said to be stable?
c) What are the disadvantages of using hard water for cooking?
d) Draw the PH scale and mark acidic and alkaline range.
e) How does temperature affect degree of Ionisation?
f) Why is an electrolytic solution always neutral?
g) Name any three corrosion resistant alloys.
h) State any 3 methods of modifying environment to control corrosion.

Only for students of Rationalised scheme:

i) What is vulcanization of rubber?
j) State any three applications of Polystyrene.

Only for students of Revised scheme:

i) What type of lubricants should be selected for delicate instruments?
j) What is flash point with reference to lubricants?

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 5s subshell is filled before 4d subshell. **(3)**
b) Write orbital electronic configuration of the following elements: (i) Fluorine (ii) Phosphorus (iii) Sodium (iv) Potassium. **(4)**
c) Explain the formation of Nitrogen molecule. **(4)**
d) Give the significance of (i) Principal Quantum Number (ii) Spin Quantum Number. **(4)**
e) Distinguish between Energy level and Sub Energy level. **(4)**

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

a) Draw a neat labelled diagram and explain Reverse Osmosis process for desalination. **(3)**
b) Discuss the causes of scale and sludge formation in boilers due to use of hard water. **(4)**
c) With reference to Zeolite process of water softening answer the following: **(4)**
(i) Write one reaction for removal of temporary hardness.
(ii) Write one reaction for removal of permanent hardness.
(iii) Write one reaction for regeneration of exhausted Zeolite.
(iv) Why turbid water should not be passed through Zeolite?
d) With reference to Ion Exchange process of water softening answer the following: **(4)**
(i) What are Ion Exchange resins?
(ii) Write one reaction each in cation exchanger and anion exchanger.
(iii) How are exhausted cation and anion exchange resins regenerated?

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e) Discuss the disadvantages of using hard water in (i) Textile Industry (ii) Sugar Industry. (4)

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

a) Give Schematic representation of Electrolysis of aqeous Copper Sulphate using copper electrodes. (3)

b) State any four postulates of Arrhenius theory of electrolytic dissociation. (4)

c) With reference to electrolysis of aqeous sodium chloride suing platinum electrodes answer the following: (4)
(i) Write Ionization reactions.
(ii) Write reactions at cathode and anode.
(iii) Why does PH increase are the end of electrolysis?

d) What is electrochemical series? Give its significance. (4)

e) Distinguish between thermosoftening and thermosetting plastic. **(only for students of Rationalised scheme)** (4)

e) Explain the mechanism of Fluid film lubrication. **(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 three principles of proper designing for corrosion control. (3)

b) With suitable example explain the process of Electroplating. (4)

c) Explain any one method of cathodic protection for corrosion control. (4)

d) Discuss oxygen absorption mechanism of Electrochemical corrosion. (4)

e) Drawn a neat labelled diagram and explain Metal Ion concentration cell corrosion. (4)

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

a) Write the reaction and name the product formed for (i) Polymerization of Ethylene (ii) Polymerization of Vinyl chloride. **(only for students of Rationalised scheme)** (3)

a) Define and give the significance of following properties of Lubricants: (i) Viscosity Index (ii) Oiliness. **(only for students of Revised scheme)** (3)

b) Explain the process of Metal spraying. (4)

c) Give two examples each of (i) Galvanic cell corrosion (ii) Differential aeration corrosion. (4)

d) Discuss the type of oxide films in oxidation corrosion. (4)

e) Explain the tinning process & state its applications. (4)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2022 Examinations

Programme: **Engineering & Technology**

Subject: **Applied Physics-I (GC103) [Rat]**

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 temperature and electric currents.
b) What is positive zero error in case of screw guage?
c) Define uniform velocity.
d) State law of conservation of energy.
e) Convert 120 rpm into radian per second.
f) Define centripetal force.
g) Give two examples of surface tension.
h) Define Young's modulus.
i) Give an example for heat transfer by convection.
j) State the relation between α, β and γ.

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

a) What are fundamental and derived units? Give two examples for each. **(3)**
b) Obtain dimensional formula of (i) Force (ii) Energy. **(4)**
c) State principle of homogeneity. Check the correctness of equation $v^2 = \frac{p}{\rho}$ using dimensions, where v is velocity, p is pressure and ρ is density. **(4)**
d) i) Define least count of Vernier caliper. **(2)**
ii) Draw and show negative zero error in screw gauge. **(2)**
e) i) Explain two examples of instrumental error. **(2)**
ii) Explain random error. **(2)**
f) A body is thrown up vertically upwards form the ground with an initial velocity of 45 m/s. Find the maximum height reached by the body and the time taken to reach it. **(4)**

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

a) State 3 differences between distance and displacement. **(3)**
b) Define kinetic energy and potential energy. Give one example for each. **(4)**
c) A train starts from rest and accelerates at the rate of 1.2 m/s^2. Calculate velocity at the end of 375m of journey. **(4)**
d) A stone is dropped from the top of building which is 150m high. With what velocity the stone will hit the ground? **(4)**
e) Define (i) 1 Newton (ii) 1 Joule **(4)**
f) What is centrifugal force? Give one example and one application of centrifugal force. **(4)**

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

a) A wheel of 30cm diameter is rotating steadily at 600 rpm. Find its angular velocity in radian/second and linear speed at a point on its rim. (3)

b) What is banking of roads? Write an expression for angle of banking and explain the terms. (4)

c) Define (i) Angular velocity (ii) Radial Acceleration. (4)

d) A curved road of radius 150m is to be constructed such that vehicle moving with the speed of 108 Km/hr can move along it safely. What should be the angle of banking? (4)

e) The acceleration due to graving at the surface of moon is 1.67 m/s^2. If the radius of moon is 1.74 x 10^6m, calculate mass of the moon. (4)

f) i) Define Elasticity. (2)
ii) State Hooke's law. (2)

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

a) Draw stress v/s strain graph and label and define elastic limit and yield point. (3)

b) Define surface tension. Explain two examples of surface tension. (4)

c) A load of 6kg when suspended from the lower end of the wire of length 2m & diameter 1mm extends it by 0.5mm. Find the value of Young's modulus. (4)

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

e) What are adhesive and cohesive forces? Why some liquids wet the containers and others do not? (4)

f) A capillary tube of diameter 1mm is dipped in water. The level of water rises through 3.2cm. Calculate surface tension of water. The density of water is 1000 Kg/m^3. (4)

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

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

b) Explain three modes of heat transfer with one example for each. (4)

c) State and explain law of thermal conductivity. Write an expression. (4)

d) Define (i) Specific heat (ii) Steady state. (4)

e) A certain mass of gas occupies 40cm^3 at 27°C and 28cm of mercury pressure. Find its volume at 47°C and 68cm of mercury pressure. (4)

f) An iron rod has length of 0.90m at 20°C. What would be its length at 80°C given coefficient of linear expansion is 0.000012 per degree centigrade. (4)

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