I SEM /COMMON/2024(W)(NEW)

ENGINEERING DRAWING-PR-3(a)

SET-5

FULL MARK :100 **TIME : 3 HOURS**

Answer any five questions including Q NO.1 & 7

1.
(a) Write down the types of lettering. [5]
(b) A pentagonal pyramid base rest on V.P. What is its top view & front view. [5]
(c) Draw the title block according to your class room. [5]
(d) Draw the projection of a point 'p' which is 15mm above H.P & 25mm behind V.P [5]

2. Construct a scale of 1:8 to show decimeter & centimeter and long enough to measure up to 1m.Show a length of 7.5dcm on the the scale. [15]

3. Draw a parabola of base 100mm & height 50mm by Rectangular method. [15]

4. A rectangular plane 60mm by 30mm has its shortest side in H.P such that surface makes an angle of 45 degree to H.P. Draw its projection. [15]

5. A line AB is 60mm long enough which is both in H.P & V.P. Draw the projection of line. [15]

6. Draw the projection of the right circular cone of base 40mm diameter and height 90mm resting with its base on H.P. and 50mm in front of V.P. [15]

7. Draw the following views of a building from the specification given below.

(a) plan at window sill level [20]

(b) Front elevation [15]

SPECIFICATION:

1. Room size =4200×3600
2. Wall thickness=300
3. Plinth height =600
4. Size of door(D)=1200×2100
5. Size of window(W)=1000×1200
6. Chajja projection=600
7. Roof, RCC Slab=100
8. Ceiling height=3000

Assume any other data if required
ALL DIMENSIONS ARE IN MM

2ND SEM./COMMON TO ALL./ 2024(S)

TH4AB Basic Electrical & Electronics

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right-hand margin indicates marks

1. Answer **All** questions **2 x 10**

a. The resistance of two coil is 25Ω when connected in series and 6Ω when connected in parallel. Determine individual resistance of two coils.
b. List few of the advantages of PMMC instrument.
c. What is the function of yoke and brush in DC machine?
d. Define 'lumen'. Write it's unit.
e. The current through a conductor can be expressed in the form: i= 7.42 Sinωt Amp. Determine the magnitude of rms value and average value of current.
f. Why capacitor input filter is preferred over choke input filter?
g. What is the importance of valence shell and valence electrons?
h. Mention the role of aquadag in CRO.
i. Indicate the various quantities that can be measured with a multimeter.
j. Differentiate active and passive transducer. Give an example of each.

2. Answer **Any Six** Questions

a. A 100V,100W lamp is connected in series with a 100V,60W lamp across 200V supply. Determine the current drawn and power consumed by each lamp. **[2.5+2.5]**
b. Describe the function of following elements in Power Plant.(a) Moderator (b) Boiler (c) Penstock (d) Economiser (e) Surge tank **[1+1+1 +1+1]**
c. A resistance of 10Ω is connected in series with an inductance of 30mH across a 100V,50Hz a.c. supply. Determine the (a) Inductive reactance,(b) Impedance, (c) Current drawn, (d)the Power Consumed and (e) the power factor. **[1+1+1 +1+1]**
d. Explain deflecting toque and controlling torque in measuring instrument. **5**
e. With a neat circuit diagram, explain the working of a half-wave rectifier along with relevant waveforms. **5**
f. Explain the working of a single-stage CE amplifier. **5**
g Modulation Index 'm' in AM is the depth of modulation. justify. **5**

3 (a) Define communication. (b) With a neat block diagram, explain the elements of a communication system. **2+8**

4 (a) Derive the expression for RMS value of an alternating quantity. **5**
(b) Compare Zener Breakdown and Avalanche breakdown. **5**

5 (a) With proper biasing condition, explain the working of a PN junction diode. **5**
(b) Draw the VI characteristics of the PN junction diode with proper labelling of relevant parameters. **5**

6 Explain the construction and working principle of fluorescent lamp with neat sketch. **10**

7 A building has the following electrical appliances (i) A 1 HP motor running for 5 hrs. in a day. (ii) Three fans each of 80W running for 10 hrs. in a day. (iii) Four tube lights of 40W running for 15 hrs. per day. Find the monthly bill for the month of February 2024 if unit cost of bill is Rs.2.50. **10**

2ND SEM. /COMMON TO ALL./2024(S)

Th-3 Engineering Mathematics-II

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

a. Evaluate $\int \sqrt{1+\cos 2x}\, dx$. 2

b. Evaluate $\int_{-1}^{1} |x|\, dx$. 2

c. Find the order and degree of the equation $3\frac{d^2y}{dx^2} = \left\{2 + \left(\frac{dy}{dx}\right)^2\right\}^{5/3}$ 2

d. State Euler's Theorem. 2

e. Find the magnitude and direction of the vector $3\hat{i} + 4\hat{j} + 12\hat{k}$. 2

f. Find the scalar product of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 3\hat{i} + 4\hat{j} - \hat{k}$. 2

g. Evaluate $\lim_{x\to 0} \frac{sin\, Ax - Sin\, Bx}{x}$. 2

h. If $z = log(x^2 - y^2)$ find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$. 2

i. Evaluate $\lim_{x\to 2} \frac{x^5-32}{x-2}$. 2

j. If $x = t^2 + 2at,\ y = t + 1$ find $\frac{dy}{dx}$. 2

2. Answer **Any Six** Questions 5 x 6

a. Find the scalar and vector projection of $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} + \hat{j} + 3\hat{k}$. 5

b. If $u = x^2 + y^2 + z^2$ then calculate $x.u_x + y.u_y + z.u_z$ 5

c. Find the area of the circle $x^2 + y^2 = 25$. 5

d. Differentiate $y = x^{sin\, x}$ with respect to x. 5

e. Solve $\frac{dy}{dt} = sint.cost.e^{sin\, t}$ 5

f. Evaluate $\int_0^{\pi/2} \frac{tan\, x}{tan\, x + cot\, x}\, dx$. 5

2ND SEM. / COMMON TO ALL ./ 2024(S)

Th-2 ENGINEERING PHYSICS

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

a. Write the SI units of the following physical quantities :
   (i) Force
   (ii) Work

b. If $\underset{A}{\rightarrow} = \hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $\underset{B}{\rightarrow} = \hat{\imath} - \hat{\jmath} + \hat{k}$, then find $\underset{A}{\rightarrow} \cdot \underset{B}{\rightarrow}$.

c. State Coulomb's law of electrostatics.

d. State the condition for maximum horizontal range of a projectile.

e. Define coefficient of friction.

f. If two resistors of resistances 2 ohm and 5 ohm are connected in series, find the equivalent resistance.

g. Write two industrial application of LASER.

h. State the relation between velocity, wavelength & frequency of a wave.

i. State two laws of reflection.

j. State First Law of Thermodynamics.

2. Answer **Any Six** Questions 6 x 5

a. State laws of limiting friction.

b. Compare longitudinal waves and transverse waves.

c. Define critical angle and explain total internal reflection with diagram.

d. State and explain triangle's law of vector addition with diagram.

e. State and explain Kirchhoff's laws(KCL and KVL) .

f. Write the properties and applications of ultrasonic waves.

g Check the dimensional correctness of the physical equation $s = 2ut + \frac{3}{2}at^2$ where symbols posses usual meaning

3 Calculate the amount of heat required to convert 5 gram of ice at -10 °C to steam at 120°C. 10

4 Derive the expressions for 5+5
(i) Total time of flight,
(ii) Maximum height attained.
by a projectile fired at an angle θ with the horizontal.

5 Derive the expressions for a) Displacement, b) Velocity and c) Acceleration of a particle moving in simple harmonic motion. 2+5+3

6 i State Faraday's laws of electromagnetic induction. 5

ii Obtain an expression for force acting on a current carrying conductor placed in an uniform magnetic field. 5

7 i State & explain Newton's law of gravitation. 5

ii Explain the variation of 'g' with altitude. 5

2ND SEM./COMMON TO ALL./ 2024(S)

TH4AB Basic Electrical & Electronics

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right-hand margin indicates marks

1. Answer **All** questions **2 x 10**
   a. The resistance of two coil is 25Ω when connected in series and 6Ω when connected in parallel. Determine individual resistance of two coils.
   b. List few of the advantages of PMMC instrument.
   c. What is the function of yoke and brush in DC machine?
   d. Define 'lumen'. Write it's unit.
   e. The current through a conductor can be expressed in the form: i= 7.42 Sinωt Amp. Determine the magnitude of rms value and average value of current.
   f. Why capacitor input filter is preferred over choke input filter?
   g. What is the importance of valence shell and valence electrons?
   h. Mention the role of aquadag in CRO.
   i. Indicate the various quantities that can be measured with a multimeter.
   j. Differentiate active and passive transducer. Give an example of each.

2. Answer **Any Six** Questions
   a. A 100V,100W lamp is connected in series with a 100V,60W lamp across 200V supply. Determine the current drawn and power consumed by each lamp. **[2.5+2.5]**
   b. Describe the function of following elements in Power Plant.(a) Moderator (b) Boiler (c) Penstock (d) Economiser (e) Surge tank **[1+1+1 +1+1]**
   c. A resistance of 10Ω is connected in series with an inductance of 30mH across a 100V,50Hz a.c. supply. Determine the (a) Inductive reactance,(b) Impedance, (c) Current drawn, (d)the Power Consumed and (e) the power factor. **[1+1+1 +1+1]**
   d. Explain deflecting toque and controlling torque in measuring instrument. **5**
   e. With a neat circuit diagram, explain the working of a half-wave rectifier along with relevant waveforms. **5**
   f. Explain the working of a single-stage CE amplifier. **5**
   g Modulation Index 'm' in AM is the depth of modulation. justify. **5**

3 (a) Define communication. (b) With a neat block diagram, explain the elements of a communication system. **2+8**

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(b) Compare Zener Breakdown and Avalanche breakdown. **5**

5 (a) With proper biasing condition, explain the working of a PN junction diode. **5**
(b) Draw the VI characteristics of the PN junction diode with proper labelling of relevant parameters. **5**

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2ND SEM./COMMON TO ALL./2024(S)

TH-1 Computer Application

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

   a Define FTP.
   b What is a recursion function?
   c Define NIC.
   d Write the functions of repeater.
   e Define MICR.
   f What are the types of software available? Name them with suitable example.
   g Define WWW.
   h Write the names of two input and two output devices.
   i Define file and folder.
   j Write the names of any two antiviruses.

2. Answer **Any Six** Questions 6 x 5

   a Write down the various characteristics of computer.
   b Write the difference between compiler and interpreter.
   c What is network? Explain the types of network.
   d Explain data storage methods of a computer.
   e Draw a flowchart to calculate average of three numbers.
   f Compare call by value method and call by reference method with suitable example.
   g Explain the types of data transmission modes.

3 Write an algorithm to calculate factorial of a number and also write a program for it in C language . 10

4 Explain the types of memory according to speed and size. 10

5 Define operating system. Write the types of operating system. 10

6 Explain the types of file access methods briefly 10

7 Draw the block diagram of a computer and explain how data flow inside the computer. 10

2ND SEM./ COMMON TO ALL./ 2024(S)
Th-1 Communicative English

Full Marks: 80 **Time- 03 Hrs**

Figures in the right hand margin indicates marks

1. Read the following passage carefully and do as directed:

3D Construction Printing is considered to be a revolutionary construction method which can replace traditional construction techniques. It refers to various technologies that use 3D printing as a core method to fabricate buildings or construction components. It is also known by alternate names such as additive construction, Autonomous Robotic Construction System (ARCS) or Freeform Construction. 3D printing technology is used in the fabrication of housing, construction components, bridges, civil infrastructure, artificial reefs and sculptures. The 3D Print Canal House was the first full-scale construction project of its kind to get off the ground. The first residential building in Europe constructed using the 3D printing construction technology, was the home in Yaroslavl (Russia) with the area of 298,5 sq. meters. 3D construction technology has many benefits. Traditional construction is tedious and time-consuming whereas 3D construction technology offers greatly reduced production time. This is because the machines themselves are very fast, some of them are capable of manufacturing 600 to 800 square-foot home in just 24 hours. Another advantage of using 3D printing in the construction industry is saving a lot of production costs on material waste. This is because a 3D printer, such as robotic arms, uses exactly the amount of material they need. This significantly reduces the waste produced. Not only that, but they are also capable of using recycled materials. 3D printers are also fully automated, which eliminates human error. It also allows for greater accuracy and innovative designs. No doubt, 3D construction printing technology is considered to be the future of architecture.

A Answer the following briefly:

i. What is 3D Construction Printing? 02

ii. List two alternate names for 3D Construction Printing mentioned in the passage. 02

iii. How does 3D construction technology reduce production time? 02

iv. What are the benefits of automation in 3D construction printing? 02

B. Find the words from the passage which have the following meanings:

i. Creation of new ideas or inventions 02

ii. Boring and monotonous 02

C. Make a sentence using any one of the following words: 02
Technology, Capable

D. Supply the antonyms on any one of the given words from the passage: 02
Error, Modern

E Make a note of the above passage 04

2. Answer **Any Five** of the following: 05 x 02

i. What lesson did the narrator learn from his encounter with Red?

ii. What is crab mentality?

iii. State the difference between 'criticizing an idea' and 'criticizing an individual.

iv. What are the qualities of a good team player?

v. Why was the Inchcape Rock dangerous?

vi. How does the poet value her friendship?

3 Fill in the following with appropriate choices, following the instructions given in the brackets:

i Sheldon is _____ honest man. (a/an) 02

ii How _____ oil is produced in India? (much/many) 02

iii You _____ follow the traffic rules. (may/must) 02

iv My master will see you after a while; he _____ his dinner now. (have) (Use the correct tense of the verb) 02

v Shut the door. (Change the voice) 02

4 A Write a paragraph in about 120 words on **any one** of the following topics: 05x01
Artificial Intelligence, Global Warming

B Answer **any one** of the following: 05x01
Your college is going to organize a technical exhibition. As you are the secretary of the students' union, draft a notice to inform all the students.

Or

Write a report on World Youth Skills Day celebration at your college.

5 Answer **Any Two** of the following: 05x02

i. You secured the first prize in State level Science Olympiad. Write a letter to your father to inform him about your achievement.

ii. You are staying in your college hostel. Due to short Circuit, there is a disruption in electric supply. Write an application to the hostel superintendent requesting him/her to take necessary steps to restore the electric supply.

iii. You are the owner of Reeta Electronics, Bapuji Nagar, Bhubaneswar. You have received some faulty TV sets. Draft a letter of complaint to M/s Bajaj Electronics, Faridabad, New Delhi

6 Rourkela Steel Plant has invited applications for the post of Junior Engineer from diploma holders in Civil, Electrical, Mechanical, Computer Science and Electronics and Telecommunication Engineering. 10
Apply for the post enclosing your resume or CV

7 Answer Any Two of the following: 05x02

i. Discuss the process of communication in detail with the diagram.

ii. Write a short note on non-verbal communication.

iii. Elaborate the various types of formal communication.

2ND SEM. / COMMON TO ALL ./ 2024(S)

Th-2 ENGINEERING PHYSICS

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1.		Answer **All** questions	2 x 10
	a.	Write the SI units of the following physical quantities : (i) Force (ii) Work	
	b.	If $\underset{A}{\rightarrow} = \hat{\imath} + 3\hat{\jmath} - \hat{k}$ and $\underset{B}{\rightarrow} = \hat{\imath} - \hat{\jmath} + \hat{k}$, then find $\underset{A}{\rightarrow} \cdot \underset{B}{\rightarrow}$.	
	c.	State Coulomb's law of electrostatics.	
	d.	State the condition for maximum horizontal range of a projectile.	
	e.	Define coefficient of friction.	
	f.	If two resistors of resistances 2 ohm and 5 ohm are connected in series, find the equivalent resistance.	
	g.	Write two industrial application of LASER.	
	h.	State the relation between velocity, wavelength & frequency of a wave.	
	i.	State two laws of reflection.	
	j.	State First Law of Thermodynamics.	
2.		Answer **Any Six** Questions	6 x 5
	a.	State laws of limiting friction.	
	b.	Compare longitudinal waves and transverse waves.	
	c.	Define critical angle and explain total internal reflection with diagram.	
	d.	State and explain triangle's law of vector addition with diagram.	
	e.	State and explain Kirchhoff's laws(KCL and KVL) .	
	f.	Write the properties and applications of ultrasonic waves.	
	g	Check the dimensional correctness of the physical equation $s = 2ut + \frac{3}{2}at^2$ where symbols posses usual meaning	
3		Calculate the amount of heat required to convert 5 gram of ice at -10 ℃ to steam at 120℃.	10
4		Derive the expressions for (i) Total time of flight, (ii) Maximum height attained. by a projectile fired at an angle θ with the horizontal.	5+5
5		Derive the expressions for a) Displacement, b) Velocity and c) Acceleration of a particle moving in simple harmonic motion.	2+5+3
6	i	State Faraday's laws of electromagnetic induction.	5
	ii	Obtain an expression for force acting on a current carrying conductor placed in an uniform magnetic field.	5
7	i	State & explain Newton's law of gravitation.	5
	ii	Explain the variation of 'g' with altitude.	5

2ND SEM. / COMMON TO ALL ./ 2024(S)

Th-2 Engineering Chemistry

Full Marks: 80 **Time- 3 Hrs**

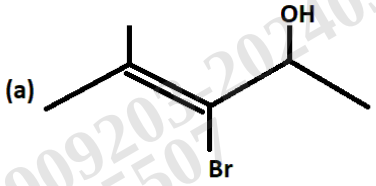
Answer any five Questions including Q No.1& 2
Figures in the right-hand margin indicates marks.

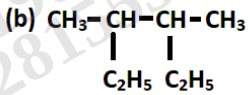
1. Answer **All** questions 2 x 10

a. Define isotone. Give a suitable example of it.
b. Define Equivalent weight. Find the equivalent weight of CH_3COOH.
c. State Aufbau Principle.
d. What is fungicide? Give an example of fungicide.
e. What are the monomers of Bakelite?
f. Write down the general formulae of alkane and alkene.
g. What do you mean by flux used during smelting?
h. Define acidic salt. Give an example of it.
i. Write down the electronic configurations of Cu and Zn^{2+}.
j. What is calorific value of fuel? Mention it's unit.

2. Answer **Any Six** Questions 6 x 5

a. Explain cold-lime soda process of softening of hard water with a neat and labelled diagram.
b. Distinguish between saturated and unsaturated hydrocarbons.
c. 500 cc of an aqueous solution contains 14.7 gm of H_2SO_4. Calculate its normality.
d. Explain froth floatation method of concentration of ores.
e. Give the IUPAC names/structural formulae of the following compounds.





(c) 3-Bromo-2-chloro-4-methylpent-2-ene

(d) 4-Chloro-3-methylhexa-2,4-dien-2-ol

(e) 2-Methylbuta-1,3-diene

f. Define covalent bonding and explain the formation of CH_4 molecule.
g Write down the composition and uses of Bakelite.

3	(a)	State Faraday's 1st law of electrolysis. How many grams of copper will be deposited at the cathode by the passage of 50 ampere of current through acidified $CuSO_4$ solution for 30 minutes? (At. Wt. of Cu = 63.5 u)	5
	(b)	Write down the composition and uses of Brass and Duralumin.	5
4	(a)	Classify salts into different types with examples.	5
	(b)	Explain distillation method of refining of crude metals.	5
5	(a)	Explain protection of corrosion by alloying.	5
	(b)	Explain the importance of P^H in sugar industries.	5
6	(a)	Write down the composition and uses of producer gas and water gas.	5
	(b)	Write down the specific uses of solid and semi-solid lubricants.	5
7	(a)	What are the drawbacks of natural rubber?	5
	(b)	Distinguish between calcination and roasting.	5

2ND SEM. /COMMON TO ALL./2024(S)

Th-3 Engineering Mathematics-II

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

   a. Evaluate $\int \sqrt{1+\cos 2x}\, dx$. 2

   b. Evaluate $\int_{-1}^{1} |x|\, dx$. 2

   c. Find the order and degree of the equation $3\frac{d^2y}{dx^2} = \left\{2 + \left(\frac{dy}{dx}\right)^2\right\}^{5/3}$ 2

   d. State Euler's Theorem. 2

   e. Find the magnitude and direction of the vector $3\hat{i} + 4\hat{j} + 12\hat{k}$. 2

   f. Find the scalar product of $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 3\hat{i} + 4\hat{j} - \hat{k}$. 2

   g. Evaluate $\lim_{x\to 0} \frac{sin\, Ax - Sin\, Bx}{x}$. 2

   h. If $z = log(x^2 - y^2)$ find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$. 2

   i. Evaluate $\lim_{x\to 2} \frac{x^5 - 32}{x-2}$. 2

   j. If $x = t^2 + 2at,\ y = t + 1$ find $\frac{dy}{dx}$. 2

2. Answer **Any Six** Questions 5 x 6

   a. Find the scalar and vector projection of $\vec{a} = \hat{i} - \hat{j} + \hat{k}$ on $\vec{b} = \hat{i} + \hat{j} + 3\hat{k}$. 5

   b. If $u = x^2 + y^2 + z^2$ then calculate $x.u_x + y.u_y + z.u_z$ 5

   c. Find the area of the circle $x^2 + y^2 = 25$. 5

   d. Differentiate $y = x^{sin\, x}$ with respect to x. 5

   e. Solve $\frac{dy}{dt} = sint.cost.e^{sin\, t}$ 5

   f. Evaluate $\int_0^{\pi/2} \frac{tan\, x}{tan\, x + cot\, x}\, dx$. 5

	g	Evaluate 'a' and 'b' if $f(x) = \begin{cases} ax^2 + b & x < 1 \\ 1 & x = 1 \\ 2ax - b & x > 1 \end{cases}$ is continuous at x=1.	5
3		Find the area of parallelogram whose adjacent sides are the vectors $\hat{i} - 3\hat{j} + \hat{k}$ and $\hat{i} + \hat{j} + \hat{k}$.	10
4		Evaluate $\lim_{x \to 0} \frac{1 - cos^3 x}{x.sin\, x}$	10
5	a.	Evaluate $\int_1^4 [x]\, dx$, where $[x]$ is the greatest integer function.	5
	b.	Evaluate $\int e^x (\sin x + \cos x) dx$.	5
6		If $y = e^{m.sin^{-1}x}$, prove that $(1 - x^2)y_2 - xy_1 = m^2 y$.	10
7	a.	Solve the differential equation $\frac{dy}{dx} + \frac{y}{x} = \frac{1}{x}$.	5
	b.	Solve $xdx - ydy = 0$.	5

2ND SEM./ COMMON TO ALL/2024(S)

Th-4 Engineering Mechanics

Full Marks: 80 **Time- 3 Hrs**

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10

   a. Define FBD with suitable sketch.

   b. Define limiting frictional force.

   c. Write the statement of Parallel Axis Theorem.

   d. Derive the relationship between mechanical advantage, velocity ratio & efficiency of the simple lifting machine.

   e. Write the "principle of conservation of energy" and "principle of conservation of momentum".

   f. Define moment of a force. Write its SI unit.

   g. Write and explain triangle law of forces.

   h. Differentiate between angle of friction and angle of repose.

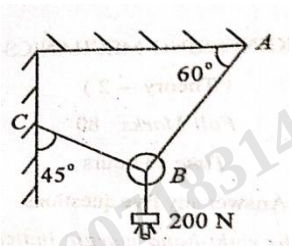
   i. A machine gun of mass 25 kg fires a bullet of mass 30 g with a velocity of 250 m/s. Find the velocity with which the machine gun will recoil.

   j. Write and explain Newton's 1st law of motion.

2. Answer **Any Six** Questions 6 x 5

   a. Explain laws of Static friction and Dynamic friction.

   b. An electric light fixture of weight 200N is supported as shown in the figure . Determine the tensile forces in the wires BA & BC.



   c. Define simple gear train and compound gear train. Derive the velocity ratio of simple gear train and compound gear train.

   d. Find the moment of inertia of the hollow circular section with external and internal diameters 100mm & 80mm respectively about centroidal axis.

   e. The value of greatest resultant and least resultant of two forces are 19N and 5N respectively. Determine the resultant force if the angle between the forces is 90^0.

   f. A ball of mass 2 kg moving with a velocity of 2 m/s hits directly on a ball of mass 4 kg at rest. The first ball, after impinging, comes to rest. Find the velocity of the second ball after the impact and the coefficient of restitution.

g Define and explain simple axle and wheel arrangement with neat diagram. Derive its velocity ratio.

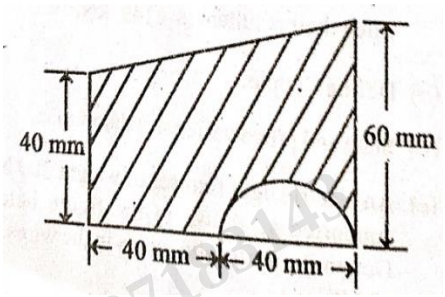
3 Find law of the machine in which an effort of 19.5N raised a load of 90N and another effort of 15.5N raised a load of 70N. Find what effort is required to lift a load of 100N. 10

4 The forces of 20N, 30N, 40N, 50N and 60N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. 10

5 A 4m ladder weighing 250N is placed against a smooth vertical wall with its lower end 1.5m away from the wall. If the co-efficient of the friction between the ladder and the floor is 0.3, show that the ladder will remain in equilibrium. 10

6 10

A semicircular area is removed from a trapezium as shown in the figure. Determine the Centroid of the remaining hatched area.



7 A body resting on a rough horizontal plane required a pull of 18N inclined at 30° to the plane just to move it. It was found that a push of 22N inclined at 30° to the plane just moved the body. Determine the weight of the body and coefficient of friction. 10