1st Sem. COMMON 2021(W) (NEW)

Th 4 a 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 force and state its unit ?

b. State the principle of transmissibility ?

c. Define FBD with suitable sketch ?

d. Define Couple and write its unit ?

e. Define angle of repose ?

f. What is coefficient of friction?

g. Differentiate between Centroid and Centre of Gravity ?

h. Define Mechanical advantage and Velocity ratio by considering a lifting machine ?

i. Define momentum and impulse ?

j. Define coefficient of restitution ?

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

a. State and prove Lami's theorem.

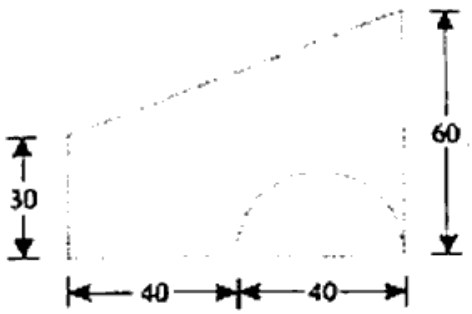
b. The resultant of two concurrent forces is perpendicular to the smaller force and angle between the forces is 120°.if the bigger force is 60 N ,find the smaller one?

c. State the laws of static friction ?

d. A certain weight lifting machine of velocity ratio 40 can lift a load of 2000 N, with the help of 150 N effort. Determine the efficiency of the machine ?

e. A smooth circular cylinder of radius 1.5 meter is lying in a triangular groove, one side of which makes 15° angle and the other 40° angle with the horizontal. Find the reactions at the surfaces of contact, if there is no friction and the cylinder weights 100 N.

f. A semicircular area is removed from a trapezium as shown in Fig.(dimensions in mm)



Determine the centroid of the remaining area (shown hatched).

g A body of mass 40 kg is moving with a constant velocity of 2.5 m/s. Now a force of 100 N is applied on the body in its direction of motion. What will be its velocity after 2 second.

3 The following forces act at a point : 10
(i) 20 N inclined at 30° towards North of East,
(ii) 25 N towards North,
(iii) 30 N towards North West, and
(iv) 35 N inclined at 40° towards South of West.
Find the magnitude and direction of the resultant force

4 A uniform ladder of length 3.25 m and weighing 250 N is placed against a smooth vertical wall with its lower end 1.25 m from the wall. The coefficient of friction between the ladder and floor is 0.3. What is the frictional force acting on the ladder at the point of contact between the ladder and the floor? Show that the ladder will remain in equilibrium in this position. 10

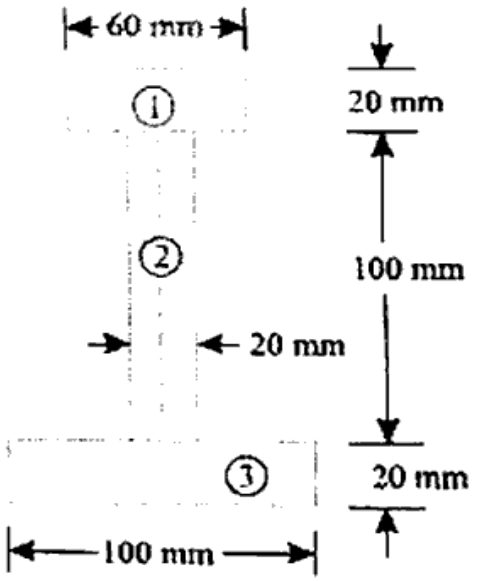
5 (a) What is reversible machine? State the condition of reversibility. 5

(b) What load can be lifted by an effort of 120 N, if the velocity ratio is 18 and efficiency of the machine at this load is 60% ? Determine the law of the machine, if it is observed that an effort of 200 N is required to lift a load of 2600 N 5

6 (a) Define Collision .state the law of conservation of linear momentum. 5

(b) A ball of mass 1 kg moving with a velocity of 2 m/s impinges directly on a ball of mass 2 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 5

7 An I-section is made up of three rectangles as shown in Fig. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section. 10



1st Sem./ COMMON /2021(W)
Th2 A 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 down the SI units of work, angular velocity, electric potential and acceleration
b. What are ultrasonics?
c. State laws of reflection.
d. What is the condition for maximum horizontal range?
e. State Newton's law of gravitation.
f. State Lenz's law.
g. Define specific heat.
h. State Fleming's right hand thumb rule.
i. Write down the properties of LASER.
j. If two capacitors with capacities 2 farad and 3 farad are connected in series connection then, find out the total capacity.

2. Answer Any Six Questions 5X6

a. Differentiate between **G** & **g** with example

b. State Laws of limiting friction.

c. State Kepler's laws of planetary motion.

d. Define critical angle and total internal reflection with a diagram.

e. Distinguish between longitudinal and transverse wave.

f. State and explain Coloumb's Law of electrostatic

g Define lines of force and write down its properties.

3 A projectile fired with an initial velocity 'u' by making an angle 'θ' with the horizontal. Derive expressions for equation of trajectory, maximum height, horizontal range and time of flight. 10

4 Derive an expression for force acting on a current carrying conductor placed in a uniform magnetic field. Distinguish between Fleming's left hand rule & Fleming's right hand rule. 10

5 Find expressions for displacement, velocity and acceleration of a particle executing in S.H.M 10

6 Calculate the total amount of heat required to convert 2.5 Kg of ice from -30°C, to a steam at 200°C. 10

7 State Kirchoff's laws. Apply it to find out balanced condition of the wheatstone bridge. 10

I – Sem/COMMON/2018(W)(New)(Reg)

ENGINEERING PHYSICS

(Theory – 2(a))

Full Marks : 80

Time : 3 hours

Answer any five questions including **Q. Nos. 1 & 2**

Figures in the right-hand margin indicate marks

1. Answer *all* questions : 2 × 10

(*a*) What are the basic units in SI system.

(*b*) State triangle law of vector addition.

(*c*) What is relation between linear velocity and angular velocity ?

(*d*) Define Work and write its SI unit.

(*e*) Define universal gravitational constant(G).

(*f*) Define transverse wave.

(*g*) Define Latent Heat.

(*h*) State the laws of refraction

(*i*) Define unit charge.

(*j*) State Lenz's law.

2. Answer any *six* questions : 5 × 6

(*a*) State the principle of homogeneity and check the correctness of the formula

$$v^2 - u^2 = 4as.$$

(*b*) A body projected vertically upward reaches height of 89 m. Calculate its initial velocity.

(*c*) Distinguish between mass and weight.

(*d*) Define ultrasonics and write its properties.

(*e*) State first law of thermodynamics.

(*f*) Define critical angle and total internal reflection.

(*g*) State Coulomb's law of magnetism and define unit pole.

(*h*) Write the properties and application of LASER.

(Turn Over)

3. Derive expression for Time of flight, Maximum height and Horizontal Range for a projectile fired at an angle θ. 10

4. State the laws of limiting friction and mention different methods to reduce friction. 10

5. (*a*) State Kepler's laws of planetary motion.

   (*b*) A body weights 40 kg wt on the surface of earth. What will be its weight on the surface of Mass of radius $\frac{1}{3}$ and mass $\frac{1}{12}$ of that of earth. 6 + 4

6. Calculate the quantity of heat required to raise the temperature of 10 gm of ice at $-10\,^{\circ}C$ to water at $60\,^{\circ}C$. 10

7. State Faraday's laws of electromagnetic induction and compare between Fleming's Left Hand Rule and Right Hand Rule. 6 + 4

2nd Sem./ COMMON / 2022(S)
Th-2A 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 unit of i) Frequency ii) Temperature
b. State Triangle's law of vector addition
c. Define vector product of 02 vectors.
d. What is Static Friction ?
e. Define Universal Gravitational Constant (G)
f. Write any two application of Ultrasonic wave.
g. Define Latent heat.
h. What is refractive Index ?
i. Define Magnetic Flux Density.
j. Mention the value of relative permittivity of free space.

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

a. Check the correctness of $T = 2\pi\sqrt{l/g}$ using Dimensional analysis.
Where the symbols used have their usual meaning

b. State Kepler's Law of Planetary Motion..
c. State Laws of Limiting Friction.
d. Differentiate between Transverse wave and Longitudinal wave-motion.
e. Draw with labelled diagram Refraction pattern through material of Prism
f. Compare Fleming's Left hand and Right hand rule.
g. State and explain Coulomb's law in magnetism.

3 Find the equations for i)Maximum height ii) Total time of Flight and iii) Horizontal range , when the projectile is fired at an angle with the horizontal 10

4 Obtain the equations for (i) Displacement (ii) velocity (iii) Acceleration of a particle in Simple Harmonic Motion (SHM) 3+4+3

5 How much heat is required to convert 10 gm of ice at -5°C to steam at 100°C? 10

6 State Kirchhoff's laws. Derive the condition of balance in a wheatstone Bridge 4+6

7 Write the Principle, Properties and Applications of LASER 10

Very Short answer questions

1.Write down the S.I. units of:

Work

Electric Potential

Frequency

Speed

Temperature

angular velocity

acceleration

Power

Wavelength

Stress

Torque

2.

If $\vec{A} = 2\hat{i} - 3\hat{j} + \hat{k}$ & $\vec{B} = 4\hat{i} + 2\hat{j}$, then find out their dot product.

State Triangle's law of vector addition

Define vector product of 2 vectors.

State parallelogram law of vector addition.

State the Principle of Homogeneity.

3.

Given $\vec{A} = 4\hat{i} + 3\hat{j} + 2\hat{k}, \vec{B} = 5\hat{i} + 2\hat{j} + \hat{k}$. Find $\vec{A} \times \vec{B}$

Under what condition the range of a projectile is maximum?

Define Angular velocity.

What is Static Friction?

Define Universal Gravitational Constant (G)

What is the condition for maximum horizontal range?

State Newton's law of gravitation.

4.

State Ohm's Law.

Three capacitors of capacitance 2F, 3F, & SF are connected in parallel. Calculate the equivalent capacitance.

If two capacitors with capacities 2 farad and 3 farad are connected in series connection then, find out the total capacity

5.

State the First law of Thermodynamics.

Define Latent heat

Define Joule's Mechanical equivalent of heat.

6.

Define specific heat.

Draw a ray diagram for refraction through prism.

7.

Define Critical angle.

What is refractive Index

State laws of reflection.

State Lenz's law.

State Fleming's right hand thumb rule.

8.

Define Magnetic Flux Density.

Mention the value of relative permittivity of free space

Define Unit Charge.

Define Unit pole.

9.

What is Optical Fibre ?

Write any two application of Ultrasonic wave

What are ultrasonics?

Write down the properties of LASER

Write down two applications of optical fibre.

State two properties of Ultrasonic.

Short answer questions

[1]. **Check the correctness of the physical equation :**

a. **$S = ut+1/2at^2$,**
b. **$T = 2\pi[l/g]$**
c. **$F = 2mv^2/r$.**

[2]. Establish the relation between (i) Linear and Angular Velocity (ii) Linear and Angular Acceleration.

[3]. Write down the properties of Ultrasonics.

[4]. State and explain Newton's law of gravitation.
[5]. Differentiate between G &g with example
[6]. Derive a relation between g &G.

[7]. State Kepler's Law of Planetary Motion..

[8]. Compare Fleming's Left-hand rule and Right hand Rule.

[9]. Write down properties of magnetic lines of force.

[10]. State and explain Kirchhoff's Laws.

[11]. State Faraday's Laws of Electromagnetic Induction.

[12]. State Laws of Limiting Friction and discuss the methods to reduce friction.

[13]. Define lines of force and write down its properties.

[14]. Differentiate between Transverse wave and Longitudinal wave-motion Draw with labelled diagram Refraction pattern through material of Prism

[15]. State and explain Coulomb's law in magnetism

[16]. State and explain Coloumb's Law of electrostatic

[17]. Define critical angle and total internal reflection with a diagram

[18]. State Kepler's laws of planetary motion.

[19]. Discuss the properties of ultrasonic.

[20]. Derive expression for Equation of trajectory, Time of flight, maximum height for a projectile fired at in angle θ with the horizontal.

[21]. Define Specific Heat. Find its unit and dimension.

[22]. Find the total capacity when three capacitors of capacity, 2μF, 3μF and 5 μF are connected in series.

Long answer questions

[1]. Derive expressions for Velocity , Displacement and Acceleration of a particle executing S.H.M.

[2]. Establish a relation between co-efficient of linear expansion (a), co-efficient of superficial expansion (B), and co-efficient of cubical expansion (Y) of a material.

[3]. Find the equations for i)Maximum height ii) Total time of Flight and Horizontal range, when the projectile is fired at an angle with the horizontal

[4]. How much heat is required to convert 10 gm of ice at $5^{o}C$ to steam at $100^{o}C$

[5]. State Kirchhoff's laws Derive the condition of balance in a wheatstone Bridge

[6]. Write the Principle. Properties and Applications of LASER

[7]. A projectile fired with an initial velocity 'u' by making an angle '0' with the horizontal. Derive expressions for equation of trajectory, maximum height, horizontal range and time of flight.

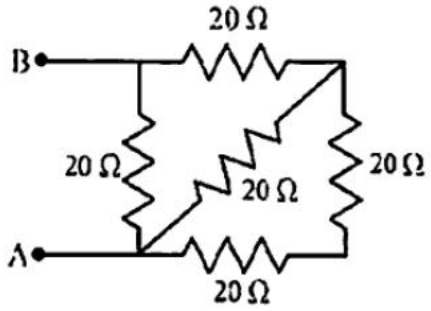
[8]. Derive an expression for force acting on a current carrying conductor placed in a uniform magnetic field. Distinguish between Fleming's left hand rule & Fleming's right hand rule.

[9]. Calculate the total amount of heat required to convert 2.5 Kg of ice from -30°C, to a steam at 200°C.

[10]. State the laws of limiting friction and discuss the methods to reduce friction.

[11]. How much steam at 100° C will melt 3.2 kg of ice at -10° C? Given that the Specific heat capacity of ice -0.5Kealkg". Specific latent heat of steam 540 Kcalig. Specific latent heat of ice - 80 Kcalkg

[12]. Find the equivalent resistances berween A &B,



13. Define the coefficients of Linear, Superficial and cubical Expansion of solids and Establish the relation a: B: γ::1:2:3 4+6

14. State Faraday's Laws of Electromagnetic Induction. Calculate the equivalent resistance of 5 resistors of 50 each connected in parallel.

15. Write short notes on any one:

Total Internal Reflection

Properties of Magnetic Lines of Force

Relation between wave parameters

Fleming's Left Hand Rule.

II- SEM/COMMON/2019(W)/NEW

Th. 2a-ENGINEERING PHYSICS

Full Marks: 80 Time: 3 Hours

Answer any Five Questions including Q No.1&2

Figures in the right hand margin indicates marks

1.	Answer **ALL** questions.	2×10
	(a) Express 1 Joule into erg.	
	(b) A force of 100N is resolved into two equal components at 60° to each other. Find the magnitude of each component.	
	(c) Establish a relation between linear velocity & angular velocity.	
	(d) State two methods to reduce friction.	
	(e) Write down the S.I. unit and dimension of specific heat.	
	(f) What are the conditions for minimum deviation when a ray of light passes through a prism?	
	(g) Two capacitors of capacitances C_1 and C_2 are connected in parallel. If a charge Q is given to the assembly the charge gets shared. What is the ratio of the charge on the capacitor C_1 to the charge on the capacitor C_2?	
	(h) The gravitational force between two objects is F. If masses of both the objects are halved without altering the distance between them, then what will be the change in gravitational force?	
	(i) State Fleming's Left Hand Rule.	
	(j) Define Population Inversion.	
2.	Answer any **SIX** questions.	5×6
	(a) Check the correctness of the following equation by dimensional analysis where the symbols have their usual meaning. $T = 2\pi\sqrt{\frac{l}{g}}$	
	(b) State the properties of magnetic lines of force.	
	(c) Distinguish between mass and weight.	
	(d) How much heat is needed to convert 0.005 kg of ice at 0°C to water at 10°C?	
	(e) Define optical fibre. Mention two of its properties and applications.	
	(f) Derive a relation between 1) farad and stat farad 2) farad and ab farad	
	(g) State laws of limiting friction.	
3.	Derive an expression for equation of trajectory, time of ascent and maximum height of a projectile fired at an angle θ with the horizontal.	10

4.	Derive an expression for displacement, velocity and acceleration of a particle executing S.H.M.	10
5.	State and explain Kirchhoff's laws with an example. Derive the condition for a balanced Wheatstone bridge.	10
6.	State Faraday's law of electro magnetic induction. A field of 0.0125 T is at right angles to a coil of area 5×10^{-3} m^2 with 1000 turns. It is removed from the field in 1/20 s. Find the e.m.f. produced.	10
7.	Establish the relation between α, β & γ. A piece of copper wire has a length of 2m at 0°C. Find its length at 100°C. Given $\alpha=17\times10^{-6}$ °C^{-1}.	10

1- SEM COMMON /2019(W)/ (NEW)

Th. 2(a) ENGINEERING PHYSICS

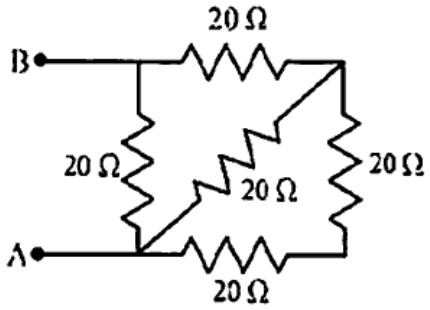
Full Marks: 80 Time : 3 Hours

Answer any FIVE Questions including Q No. 1 & 2

Figures in the right hand margin indicates marks

1.	Answer ALL the questions:	2×10
(a)	Write down the units of the following physical quantities : i) Power ii) Wavelength iii) Stress iv) Torque	
(b)	State parallelogram law of vector addition.	
(c)	Given $\vec{A} = 4\hat{i} + 3\hat{j} + 2\hat{k}, \vec{B} = 5\hat{i} + 2\hat{j} + \hat{k}$. Find $\vec{A} \times \vec{B}$	
(d)	Under what condition the range of a projectile is maximum?	
(e)	Write down two applications of Ultrasonics.	
(f)	Define Joule's Mechanical equivalent of heat.	
(g)	State the laws of reflection.	
(h)	Write down two applications of optical fibre.	
(i)	Define Unit pole.	
(j)	State Lenz's law.	
2.	Answer any SIX questions:	
(a)	Check the correctness of formula dimensionally. $T = 2\pi\sqrt{\frac{l}{g}}$.	5 × 6
(b)	State Kepler's laws of planetary motion.	
(c)	Distinguish between longitudinal and transverse wave.	
(d)	Discuss the properties of ultrasonic.	
(e)	Define critical angle and total internal reflection.	
(f)	State and explain Coulomb's law of electrostatics.	
(g)	Distinguish between Fleming's left hand rule and Fleming's right hand rule.	
3.	Derive expression for Equation of trajectory, Time of flight, maximum height for a projectile fired at an angle θ with the horizontal.	10
4.	State the laws of limiting friction and discuss the methods to reduce friction.	10

5.i)	State and explain Newton's laws of gravitation.	6
ii)	Derive a relation between g &G.	4
6.	How much steam at 100^0 C will melt 3.2 kg of ice at -10^0 C ? Given that the Specific heat capacity of ice =0.5Kcalkg^{-1}, Specific latent heat of steam = 540 Kcalkg^{-1}, Specific latent heat of ice =80 Kcalkg^{-1} .	10
7.i)	State Kirchhoff's laws.	4
ii)	Find the equivalent resistances between A &B.	6



Total Pages – 2

I – Sem/COMMON/2019(S)(New)

ENGINEERING PHYSICS

(Theory : 2 (A))

Full Marks : 80 *Time* : 3 hours

Answer any **five** questions including **Q.Nos.1 & 2**

Figures in the right-hand margin indicate marks

1. Answer *all* questions : 2 × 10

(*a*) State the Principle of Homogeneity.

(*b*) Define Universal Gravitational Constant (G).

(*c*) State Triangle law of vector addition.

(*d*) State two properties of Ultrasonic.

(*e*) State the Laws of Refraction.

(*f*) Define Unit Charge.

(*g*) Define Joule's Mechanical Equivalent of Heat.

(*h*) State Ohm's Law.

(*i*) Mention the properties of LASER.

(*j*) State Lenz's Law.

2. Answer any *six* questions : 5 × 6

(*a*) Check the correctness of the relation dimensionally : $F = 2mv^2/r$.

(*b*) Establish the relation between (*i*) Linear and Angular Velocity (*ii*) Linear and Angular Acceleration.

(*c*) Distinguish between Transverse wave and Longitudinal wave.

(*d*) State Kepler's Laws of Planetary Motion.

(*e*) State the Laws of Limiting Friction.

(*f*) Define Specific Heat. Find its unit and dimension.

(*g*) State Coulomb's Laws in Magnetism.

(*h*) Find the total capacity when three capacitors of capacity, 2μF, 3μF and 5 μF are connected in series.

3. Derive expression for displacement, velocity and acceleration of a particle executing. Simple Harmonic Motion. 10

4. State Kirchhoff's Laws and obtain Balanced condition of Wheatstone's Bridge. 4 + 6

5. Define the coefficients of Linear, Superficial and cubical Expansion of solids and Establish the relation $\alpha : \beta : \gamma :: 1 : 2 : 3$. 4 + 6

6. State Faraday's Laws of Electromagnetic Induction. Calculate the equivalent resistance of 5 resistors of 5Ω each connected in parallel. 6 + 4

7. Write short notes on any *two* : 5 × 2

   (*i*) Total Internal Reflection

   (*ii*) Properties of Magnetic Lines of Force

   (*iii*) Relation between wave parameters

   (*iv*) Fleming's Left Hand Rule.

2ND SEM ./COMMON / 2023(S)NEW

TH-2(a) 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 down the **S.I.** units of :
   i. Work
   ii. Electric Potential
   iii. Frequency
   iv. Speed

b. If $\vec{A} = 2\hat{i} - 3\hat{j} + \hat{k}$ & $\vec{B} = 4\hat{i} + 2\hat{j}$, then find out their dot product.

c. Define Angular velocity.

d. Three capacitors of capacitance 2F, 3F, & 5F are connected in parallel. Calculate the equivalent capacitance.

e. State the First law of Thermodynamics.

f. Draw a ray diagram for refraction through prism.

g. Define Critical angle.

h. What is Optical Fibre ?

i. Define ground waves.

j. Define Unit Charge.

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

a. Check the correctness of the physical equation : $S = ut + \frac{1}{2}at^2$.

b. Write down the properties of Ultrasonics.

c. State and explain Newton's law of gravitation.

d. Compare Fleming's Left-hand rule and Right hand Rule.

e. Write down properties of magnetic lines of force.

f. State and explain Kirchhoff's Laws.

g State Faraday's Laws of Electromagnetic Induction.

3 Derive expressions for (i) Velocity and (ii) Acceleration of a particle executing S.H.M. 7+3

4 Establish a relation between co-efficient of linear expansion (α), co-efficient of superficial expansion (β), and co-efficient of cubical expansion (Υ) of a material. (10)

5 Obtain expressions for (i) Time of flight and (ii) Horizontal range, for a projectile projected with initial velocity 'u', by making an angle 'Θ' with the horizontal. 5+5

6 (i) State laws of limiting friction . (5+5=10)
(ii) Explain different methods to reduce friction.

7 Write short notes on: (5+5=10)
i. Difference between Heat and Temperature.
ii. Properties of LASER.