17606

BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – Dip.CE-2024/Dip.EE-2024/Dip.ME-2024/Dip.RA-2024
Course Name – Engineering Mechanics
Course Code - DES00003
(Semester II)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A
(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) The total momentum of a system of masses (i.e. moving bodies) in any one direction remains constant, unless acted upon by an external force in that direction. This statement is described as

a) Newton's first law of motion
b) Newton's second law of motion
c) Principle of conservation of energy
d) Principle of conservation of momentum

(ii) Identify the following is not a scalar quantity.

a) Time
b) Mass
c) Volume
d) Acceleration

(iii) Select the appropriate statement from the following options regarding force.

a) A number of forces acting at a point will be in equilibrium if their total sum is zero
b) A number of forces acting at a point will be in equilibrium if two resolved parts in two directions at right angles are equal
c) A number of forces acting at a point will be in equilibrium if sum of resolved parts in any two perpendicular directions are both zero
d) None of these

(iv) Identify their resultant if two equal forces of magnitude P act at an angle of 9°.

a) P/2 cos 9/2
b) P sin 9/2
c) 2P tan 9/2
d) 2P cos 9/2

(v) Identify from the following options that is not a vector quantity.

a) Weight
b) Velocity
c) Acceleration
d) Speed

(vi) Identify the correct condition, if two coplanar couples having equal and opposite moments.

a) They balance each other
b) They produce a couple and an unbalanced force
c) They are equivalent
d) They cannot balance each other

(vii) Select the position of center of gravity of a triangle.

a) It lies at the point of concurrence of the medians
b) It lies at the point of intersection of its altitudes
c) It lies at the point of intersection of bisector of angles
d) It lies at the point of intersection of diagonals

(viii) Identify the incorrect condition for the equilibrium in free body diagram for calculation of the normal forces, consider all forces to be straight and linear.

a) $\sum Fx=0$
b) $\sum F\neq 0$
c) $\sum Fz=0$
d) None of these

(ix) Select the name of the law which state that every action has an equal and opposite reaction.

a) Newton's first law
b) Newton's second law
c) Newton's third law
d) None of the mentioned

(x) Limiting force of friction is defined as,

a) tangent of angle between normal-reaction and the resultant of normal reaction and limiting friction
b) ratio of limiting friction and normal reaction
c) the friction force acting when the body is just about to move
d) the friction force acting when the body is in motion

(xi) Select the correct statement about kinetics friction.

a) tangent of angle between normal reaction and the resultant of normal reaction and the limiting friction
b) ratio of limiting friction and normal reaction
c) the friction force acting when the body is just about to move
d) the friction force acting when the body is in motion

(xii) Identify the motion of a particle, round a fixed axis.

a) Translatory
b) Circular
c) Rotary
d) Both a and b

(xiii) Select from following which deals with the correlation between forces and resulting motion of bodies on which they act.

a) Statics
b) Kinetics
c) Kinematics
d) None of these

(xiv) Null Vector is defined as,

a) Negative Vector
b) Unit Vector
c) Free Vector
d) Zero Vector

(xv) Select the unit of UDL.

a) KN-m
b) KN/m
c) KN
d) None of these

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Differentiate between moment and couple. (3)

3. Explain about the perpendicular axis theorem. (3)

4. Explain the laws of static friction. (3)
5. Define the term like parallel forces and unlike parallel forces. (3)
6. Conclude a short note on a screw jack. (3)

OR

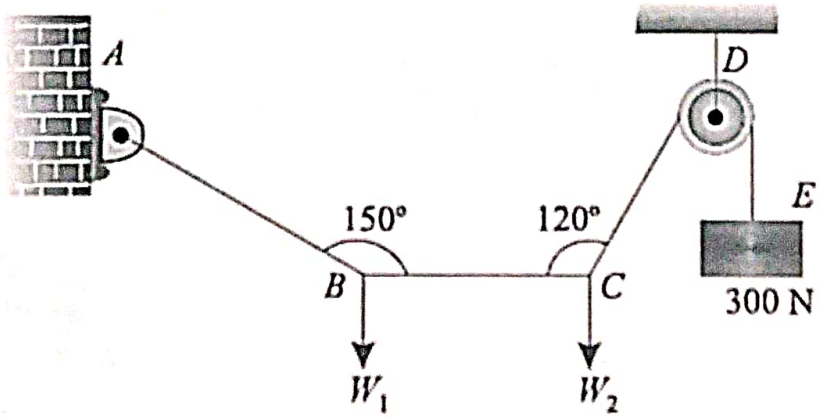
Evaluate a short note on differential wheel and axle. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Explain Cone of Friction with a neat sketch. (5)

8. A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Fig. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, tell the following values - (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W_1 and W_2. (5)



9. State different principles of Equilibrium. (5)
10. Explain the concept that centroid and centroid of gravity are applied in determining the stability of structures. (5)

11. Distinguish clearly between uniformly distributed load, uniformly varying load and triangular load. (5)

12. In a lifting machine, an effort of 500 N is to be moved by a distance of 20 m to raise a load of 10000 N by a distance of 0.8 m. Calculate the velocity ratio and mechanical advantage. (5)

OR

Explain the difference between simple machine and compound machine. (5)

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