



BRAINWARE UNIVERSITY

Term End Examination 2024-2025

Programme – Dlp.CSE-2024

Course Name – Engineering Mechanics

Course Code - DES00003

(Semester I)

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Brainware University
338, Ramkrishnapur Road, Barasat
Kolkata, West Bengal-700125

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) Select the unit of power in S.I
- | | |
|-----------------|-----------------------|
| a) Newton meter | b) Watt |
| c) Joule | d) Kilogram meter/sec |
- (ii) The algebraic sum of the resolved parts of a number of forces in a given direction is equal to the resolved part of their resultant in the same direction. Select the name of the principal from the following options.
- | | |
|--------------------------------------|--|
| a) principle of forces | b) principle of independence of forces |
| c) principle of dependence of forces | d) principle of resolution of forces |
- (iii) Choose from the following options which is not the unit of power
- | | |
|------------------|---------------------|
| a) kW (kilowatt) | b) HP (horse power) |
| c) kcal/sec | d) kcal/kg sec |
- (iv) A force is completely defined when we specify
- | | |
|-------------------------|-------------------------|
| a) Magnitude | b) Direction |
| c) Point of application | d) All of the mentioned |
- (v) Identify the force of friction when a ladder is resting on smooth ground and leaning against vertical wall
- | | |
|---|---|
| a) the force of friction will be downwards at its upper end | b) the force of friction will be upwards at its upper end |
| c) the force of friction will be perpendicular to the wall at its upper end | d) the force of friction will be zero at its upper end |
- (vi) Select the correct statement about static friction
- | | |
|--|---|
| a) It is less than dynamic friction | b) It is equal to dynamic friction |
| c) It is greater than dynamic friction | d) It has no relation with dynamic friction |
- (vii) A machine having an efficiency greater than 50%, is defined as
- | | |
|-----------------------|---------------------|
| a) Reversible machine | b) Compound machine |
|-----------------------|---------------------|

- c) Non-reversible machine
- d) Neither reversible nor non-reversible machine
- (viii) Select the position of the centre of gravity of a uniform rod
- a) At its end
- b) At its centre of its cross sectional area
- c) At its middle point
- d) None of these
- (ix) Determine the position of the centre of gravity of a rectangle which has a dimension of 10cm x 20cm
- a) (20,5)
- b) (10,5)
- c) (5,10)
- d) None of these
- (x) Select the structure which is a horizontal structural member subjected to transverse loads perpendicular to its axis
- a) Column
- b) Strut
- c) Beam
- d) Truss
- (xi) Choose the correct statement from the given options
- a) Moving train is an example of point load.
- b) Moving train is an example of cantered load
- c) Moving train is an example of rolling load
- d) Moving train is an example of uniformly varying load
- (xii) Select the Units of U.D.L
- a) KN-m
- b) KN/m
- c) KN
- d) None of these
- (xiii) The axis about which moment of area is taken is defined as
- a) Axis of area
- b) Axis of rotation
- c) Axis of moment
- d) Axis of reference
- (xiv) A differential pulley block has larger and smaller diameters of 100 mm and 80 mm respectively. Determine its velocity ratio.
- a) 5
- b) 10
- c) 20
- d) 40
- (xv) Determine the efficiency of a self-locking lifting machine
- a) More than 75%
- b) Less than 50%
- c) 100%
- d) 0%

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Group-B

(Short Answer Type Questions)

3 x 5=15

2. Explain the conditions of equilibrium. (3)
3. Determine the magnitude of the resultant of two forces equal to 50N and 30N acting at an angle of 60° (3)
4. Define angle of repose. (3)
5. Distinguish between centre of gravity and centroid. (3)
6. Distinguish between a simple wheel and axel. (3)

OR

Is a Screw Jack "Self Locking Machine"? Analyze with proper statement. (3)

Group-C

(Long Answer Type Questions)

5 x 6=30

7. If two objects of 30 kg and 10 kg move with equal kinetic energy, then identify is the ratio of magnitudes for linear momentum. (5)
8. Show that if three coplanar forces, acting at a point be in equilibrium, then, each force is proportional to the sine of the angle between the other two. (5)

9. Explain the following terms (a) Moment of Inertia (b) Polar Moment of Inertia (c) Radius of Gyration (5)
10. Calculate the centre of gravity of an inverted T-section with flange $60 \text{ mm} \times 10 \text{ mm}$ and web $50 \text{ mm} \times 10 \text{ mm}$. (5)
11. (5)

State and explain parallelogram law of forces.

12. In a certain weight lifting machine, a weight of 1 kN is lifted by an effort of 25 N . While the weight moves up by 100 mm , the point of application of effort moves by 8 m . Calculate mechanical advantage, velocity ratio and efficiency of the machine. (5)

OR

(5)

Explain the working principle of a screw jack with appropriate figure.

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