BRAINWARE UNIVERSITY

Term End Examination 2024-2025
Programme – B.Tech.(ME)-2023/B.Tech.(EE)-2023
Course Name – Engineering Mechanics
Course Code - ES-ME301
(Semester III)

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 force which combine at one point and their lines of action also lie on the same plane are define as

a) Coplannar Concurrent. b) Coplannar Non-Concurrent.
c) Non-Coplannar Concurrent. d) None of these.

(ii) Angle of friction is explain as

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

(iii) The frictional force is indicate by

a) $2\mu R$ b) $\mu R/2$
c) μR d) $\mu R/4$

(iv) Relate the center of gravity of a triangle lies at the point of

a) intersection of its altitudes b) intersection of bisector of angles
c) intersection of diagonals d) concurrence of the medians

(v) For stable equilibrium, transform of the potential energy will be

a) maximum b) minimum
c) zero d) equal to kinetic energy

(vi) _____ is not the condition for the equilibrium in free body diagram for calculation of the normal forces

a) $\sum Fx = 0$ b) $Fy = 0$
c) $\sum Fz = 0$ d) $\sum F \neq 0$

(vii) On the ladder resting on the ground and leaning against a smooth vertical wall, the force of friction will be apply to

a) downwards at its upper end
b) upwards at its upper end
c) perpendicular to the wall at its upper end
d) zero at its upper end

(viii) Dynamic friction as compared to static friction is

a) same
b) more
c) less
d) may be less of more depending on nature of surfaces and velocity

(ix) Identify the following is not a scalar quantity

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

(x) Choose the statement from the following which is true

a) Forces are called concurrent when their lines of action meet in one point
b) Forces are called concurrent when their lines of action meet in two point
c) Forces are called concurrent when their lines of action meet in plane
d) Forces are called concurrent when their lines of action meet in perpendicular planes

(xi) Identify the correct statement about free body diagram

a) Free body diagram can be applied only in dynamic Equilibrium Problem
b) Free body diagram can be applied only in static Equilibrium Problem
c) Free body diagram can be applied only in both Static and Dynamic Equilibrium Problem
d) Free body diagram can be applied only in None of these

(xii) Identify the appropriate statement from the following options

a) Only one type of support for the beams
b) Only two types of support for the beams
c) Only three types of support for the beams
d) There are various types of support for the beams and they are countless

(xiii) Select the condition when the body will move

a) Force of friction = applied force
b) Force of friction > applied force
c) Force of friction < applied force
d) None of these

(xiv) If the angle of friction is zero, determine the amount of friction which will be experienced by the body

a) Zero friction
b) Infinite friction
c) The force of friction will act normal to the plane
d) The force of friction will act in the direction of motion

(xv) Determine the radius of gyration of a circular plate of diameter 10 cm

a) 1.5cm
b) 2.0cm
c) 2.5cm
d) 3.5 cm

Group-B

(Short Answer Type Questions) 3 x 5=15

2. State the principle 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. Explain about the role of Centre of gravity for affecting the balance. (3)
5. Explain the laws of static friction. (3)
6. A spring-mass system (K1 -m1) has a natural frequency f1. Calculate the value of K2 another spring which when connected to K1 in parallel increases the frequency by 30%. (3)

OR

Determine the coordinates of the centroid of a triangle whose vertices are (-1, -3), (2, 1) and (8, -4) (3)

Group-C
(Long Answer Type Questions) 5 x 6=30

7. Two unlike parallel forces of magnitude 400 N and 100 N are acting in such a way that their lines of action are 150 mm apart. Identify the magnitude of the resultant force and the point at which it acts. (5)

8. Explain the different types of Beams. (5)

9. Calculate the resultant and direction of Force F=3i-4j (5)

10. (5)

A screw jack has a thread of 10 mm pitch. Calculate the effort which is applied at the end of a handle 400 mm long will be required to lift a load of 2 kN, if the efficiency at this load is 45%.

11. A homogenous block of weight 150 N and height 20 cm rests on a horizontal surface on the square base of side 10 cm. A force P is applied horizontally to the block at a height of h cm. If the coefficient of friction is 0.30, Calculate the maximum value of h so that the block slieds without toppling. (5)

12. Caltuate the the centroid of an unequal angle section 100 mm × 80 mm × 20 mm. (5)

OR

Calculate the centre of gravity of a 'C' type section 100 mm × 50 mm × 15 mm. (5)

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