



BRAINWARE UNIVERSITY
Term End Examination 2020 - 21
Programme – Diploma in Civil Engineering
Course Name – Engineering Mechanics
Course Code - DCE105

Semester / Year - Semester I

Time allotted : 75 Minutes

Full Marks : 60

[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 60=60

1. (Answer any Sixty)

(i) The unit of force in S.I. units is

- | | |
|-------------|-----------|
| a) kilogram | b) newton |
| c) watt | d) dyne |

(ii) Which is the correct statement about law of polygon of forces?

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a) if any number of forces acting at a point can be represented by the sides of a polygon taken in order, then the forces are in equilibrium | b) if any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon, then the forces are in equilibrium |
| c) if a polygon representing forces acting at a point is closed then forces are in equilibrium | d) if any number of forces acting at a point can be represented in direction and magnitude by the sides of a polygon taken in order, then the forces are in equilibrium |

(iii) If a number of forces act simultaneously on a particle, it is possible

- | | |
|--------------------------------------------------|----------------------------------------------------|
| a) not a replace them by a single force | b) to replace them by a single force |
| c) to replace them by a single force through C.G | d) if any number of forces acting at a point E9:J9 |

(iv) 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. This is as per the principle of

- a) forces
- b) independence of forces
- c) dependence of forces
- d) Resolution of forces

(v) Which of the following do not have identical dimensions?

- a) Momentum and impulse
- b) Torque and energy
- c) Torque and work
- d) Moment of a force and angular momentum

(vi) Which of the following is not the unit of power?

- a) kW (kilowatt)
- b) HP (horse power)
- c) kcal/sec
- d) kcal/kg sec.

(vii) Which of the following is not the unit of pressure?

- a) kg/cm²
- b) pascal
- c) atmospheric pressure
- d) Newton.

(viii) The forces, which meet at one point, but their lines of action do not lie in a plane, are called

- a) coplanar non-concurrent forces
- b) non-coplanar concurrent forces
- c) non-coplanar non-concurrent forces
- d) intersecting forces

(ix) Which of the following is a vector quantity?

- a) energy
- b) mass
- c) momentum
- d) angle

(x) According to principle of moments

- a) if a system of coplanar forces is in equilibrium, then their algebraic sum is zero
- b) if a system of coplanar forces is in equilibrium, then the algebraic sum of their moments about any point in their plane is zero
- c) the algebraic sum of the moments of any two forces about any point is equal to
- d) positive and negative couples can be balanced

moment of the resultant about the same point

(xi) If a rigid body is in equilibrium under the action of three forces, then

- a) these forces are equal
- b) the lines of action of these forces meet in a point
- c) the lines of action of these forces
- d) (b) and (c) above

(xii) A heavy ladder resting on floor and against a vertical wall may not be in equilibrium, if

- a) the floor is smooth, the wall is rough
- b) the floor is rough, the wall is smooth
- c) the floor and wall both are smooth surfaces
- d) the floor and wall both are rough surfaces

(xiii) In actual machines, mechanical advantage is _____ velocity ratio

- a) Equal to
- b) Less than
- c) Greater than
- d) None of these

(xiv) Two coplanar couples having equal and opposite moments

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

(xv) The moment of inertia of a solid sphere of mass 'm' and radius 'r' is

- a) $\frac{2mr^2}{3}$
- b) $\frac{2mr^2}{5}$
- c) mr^2
- d) $\frac{mr^2}{2}$

(xvi) The ratio of limiting friction and normal reaction is known as

- a) coefficient of friction
- b) angle of friction
- c) angle of repose
- d) sliding friction

- (xvii) Center of gravity of a solid cone lies on the axis at the height
- a) one-fourth of the total height above base b) one-third of the total height above base
 c) one-half of the total height above base d) three-eighth of the total height above
- (xviii) Center of gravity of a thin hollow cone lies on the axis at a height of
- a) one-fourth of the total height above base b) one-third of the total height above base
 c) one-half of the total height above base d) three-eighth of the total height above the base
- (xix) On a ladder resting on smooth ground and leaning against vertical wall, the force of friction will be
- 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
- (xx) The phenomena of horizontal pull and push explain what?
- a) Theory of friction b) Theory of relativity
 c) Theory of action d) Theory of forces
- (xxi) The C.G. of a right circular solid cone of height h lies at the following distance from the base
- a) $h/2$ b) $J/3$
 c) $h/6$ d) $h/4$
- (xxii) What is the S.I unit of work done?
- a) Joule b) Newton meter
 c) Both a. and b d) None of the above
- (xxiii) Pick up the incorrect statement from the following :
- a) The C.G. of a circle is at its center b) The C.G. of a triangle is at the intersection of its medians
 c) The C.G. of a rectangle is at the inter- d) The C.G. of a semicircle is at a distance

section of its diagonals

0.23 mm from its base

(xxiv) For equilibrium the normal forces acts in which direction in the free body diagrams?

- a) Vertically Upward
- b) Vertically Downward
- c) Horizontally Right
- d) Horizontally Left

(xxv) We show the net forces by the help of _____ forces.

- a) Rotational
- b) Linear
- c) Helical
- d) Resultants

(xxvi) Which formula is used to calculate angle of static friction (θ)?

- a) $\tan^{-1} \mu_s$
- b) $\sin^{-1} \mu_s$
- c) $\cos^{-1} \mu_s$
- d) none of the above

(xxvii) Angle of friction is the

- 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

(xxviii) Frictional force encountered after commencement of motion is called

- a) post friction
- b) limiting friction
- c) kinematic friction
- d) dynamic friction

(xxix) Pick out the wrong statement about friction force for dry surfaces.

Friction force is

- a) proportional to normal load between the surfaces
- b) dependent on the materials of contact surface
- c) proportional to velocity of sliding
- d) independent of the area of contact

surfaces

(xxx) A particle moves along a straight line such that distance (x) traversed in t seconds is given by $x = t^2 (t - 4)$, the acceleration of the particle will be given by the equation

- a) $3t^2 - 1t$
- b) $3t^2 + 2t$
- c) $6t - 8$
- d) $6t - 4$

(xxxii) A particle moving with respect to fixed frame of reference is called as _____

- a) absolute motion
- b) relative motion
- c) rectilinear motion
- d) none of the above

(xxxiii) The rate of change of _____ with respect to time is called as jerk.

- a) acceleration
- b) density
- c) displacement
- d) volume

(xxxiv) Limiting force of friction is the

- 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

(xxxv) Dynamic friction as compared to static friction is

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

(xxxvi) A semi-circular disc rests on a horizontal surface with its top flat surface horizontal and circular portion touching down. The coefficient of friction between semi-circular disc and horizontal surface is μ . This disc is to be pulled

by a horizontal force applied at one edge and it always remains horizontal.

When the disc is about to start moving, its top horizontal force will

- a) remain horizontal
- b) slant up towards direction of pull
- c) slant down towards direction of pull
- d) unpredictable

(xxxvi) The algebraic sum of moments of the forces forming couple about any point in their plane is

- a) equal to the moment of the couple
- b) constant
- c) both of above are correct
- d) both of above are correct

(xxxvii) A machine which can take a body from the ground to a definite elevation with the application of smaller effort , can be called as

- a) compound machine
- b) heavy mahine
- c) grouting machine
- d) lifting mahine

(xxxviii) Which of the following is not a vector quantity?

- a) Energy
- b) Mass
- c) Momentum
- d) Angle

(xxxix) The mechanical advantage of a lifting machine is the ratio of

- a) Distance moved by effort to the distance moved by load
- b) Load lifted to the effort applied
- c) Output to the input
- d) none of these

(xl) A machine having an efficiency greater than 50%, is known as

- a) Reversible machine
- b) Compound machine
- c) Non-reversible machine
- d) Neither reversible nor non-reversible machine

(xli) The motion of a particle round a fixed axis is

- a) Translatory
- b) Circular

c) Rotary

d) Both a. and b.

(xlii) If rain is falling in the opposite direction of the movement of a pedestrian, he has to hold his umbrella

a) More inclined when moving

b) Less inclined when moving

c) More inclined when standing

d) Less inclined when standing

(xliii) The point at which the total area of a plane figure is assumed to be concentrated is called _____

a) Centre of gravity

b) Central point

c) Mid point

d) None of these

(xliv) Where will be the centre of gravity of a uniform rod lies?

a) At its end

b) At its centre of its cross sectional area

c) At its middle point

d) None of these

(xlv) Where the center of gravity of a circle lies?

a) At its centre

b) Anywhere on its radius

c) Anywhere on its circumference

d) None of these

(xlvi) The center of gravity of a circle of radius 10 cm will be _____

a) At its center of the diameter

b) At the center of the radius

c) Anywhere on the circumference

d) None of these

(xlvii) A rectangle has dimension of 10cm x 20cm. where will be its center of gravity?

a) (20,5)

b) (10,5)

c) (5,10)

d) None of these

(xlviii) The axis about which moment of area is taken is known as _____

a) Axis of area

c) Axis of moment

b) Axis of rotation

d) Axis of reference

(xlix) What is the unit of radius of gyration?

a) m⁴

c) m

b) N

d) None of these

(l) What will be the the radius of gyration of a circular plate of diameter 10 cm?

a) 1.5cm

c) 2.5cm

b) 2.0cm

d) None of these

(li) _____ is a horizontal structural member subjected to transverse loads perpendicular to its axis.

a) Column

c) Beam

b) Strut

d) Truss

(lii) Example for cantilever beam is _____

a) Portico slabs

c) Bridges

b) Roof slab

d) Railway sleepers

(liii) Fixed beam is also known as _____

a) Built on beam

c) Rigid beam

b) Encastered beam

d) Tye beam

(liv) U.D.L stands for?

a) Uniformly diluted length

c) Uniformly developed loads

b) Uniformly distributed loads

d) None of these

(lv) Moving train is an example of _____ load.

a) Point load

c) Rolling load

b) Cantered load

d) Uniformly varying load

(lvi) A beam which extends beyond its supports can be termed as _____

- a) Overhang beam
- b) Over span beam
- c) Tee beams
- d) Isolated beams

(lvii) A simple support offers only _____ reaction normal to the axis of the beam.

- a) Horizontal
- b) Vertical
- c) Inclined
- d) None of these

(lviii) Hinge support is called as _____

- a) Socket joint
- b) Socket joint
- c) Pin joint
- d) Ball joint

(lix) For a simply supported beam, the moment at the support is always _____

- a) Maximum
- b) Zero
- c) Minimum
- d) None of these

(lx) Hinged supports offer vertical and _____ reaction.

- a) Horizontal
- b) Rotation
- c) Couple
- d) None of these