

Seat No.	
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Day & Date: Monday 19-05-2025
Time: 10:00 AM To 01:00 PM

Instructions:

- 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in Answer Book Page no 03 (Starting page of the Answer Book). Each question carries one mark.
- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figure to the right indicate full marks.

Marks:14

14

- 1) If a body is in equilibrium, we may conclude that _____.
 - a) No force is acting on the body
 - b) The resultant of all forces acting on it is zero
 - c) Algebraic sum of moments of force about any point is zero
 - d) Both (b) and (c)
- 2) The type of beam support that can resist a Moment is called as _____.
 - a) Roller support
 - b) Hinged Support
 - c) Pin support
 - d) Fixed support
- 3) Coefficient of friction depends upon _____.
 - a) Area of contact only
 - b) Nature of contact surface only
 - c) Both (a) and (b)
 - d) None
- 4) A framed structure of triangular shape is _____.
 - a) Perfect
 - b) Imperfect
 - c) Difficult
 - d) Redundant
- 5) To solve a truss by the method of Joints, the number of unknown forces at a joint should not be _____.
 - a) Less than two
 - b) More than two
 - c) More than three
 - d) Cannot be said
- 6) A motion of a moving car is given by an equation $s = t^3 + 3t^2 + 5$ where S is the distance traveled in m & t is the time in sec. The velocity of the car after 2 seconds will be _____.
 - a) 4m/sec
 - b) 8m/sec
 - c) 20m/sec
 - d) 24m/sec

- 7) The horizontal range of a projectile is maximum when an angle of projection is _____.
 a) 30° b) 45°
 c) 60° d) 75°
- 8) Centroidal Rotation of body about _____.
 a) Axis Parallel to its centroidal axis
 b) Axis perpendicular to its plane of rotation & passing through its center
 c) Both (a) & (b)
 d) None of these
- 9) Inertia force during retardation acts in _____.
 a) Same direction of motion
 b) Opposite direction of motion
 c) Perpendicular direction motion
 d) Both (a) & (b)
- 10) D'Alembert Principle basically depends upon _____.
 a) Newton's Ist Law b) Newton's IInd Law
 c) Newton's IIIrd d) None of these
- 11) Impulse is product of _____.
 a) Force x distance b) Force x acceleration
 c) Force x time d) Force x mass
- 12) SI unit of Work is _____.
 a) $N.m$ b) $\frac{N.m}{sec}$
 c) $\frac{N.m}{sec^2}$ d) None of these
- 13) If axis symmetry exists then it passes through the _____.
 a) Centroid b) Base
 c) Top of web d) Side flange
- 14) M-I of triangular about centroidal horizontal axis of breadth 'b' & height 'h' _____.
 a) $\frac{bh^3}{36}$ b) $\frac{bh^3}{12}$
 c) $\frac{bh^3}{4}$ d) none

Seat No.	
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F. Y. (B.Tech.) (Sem-I) (New) (NEP CBCS) Examination: March/April-2025
Engineering Mechanics (BTCE0106)/ (BTCSE0106) / (BTETE0106)/
(BTEE0106)/ (BTME0106)/(BTECE0106)

Day & Date: Monday 19-05-2025
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

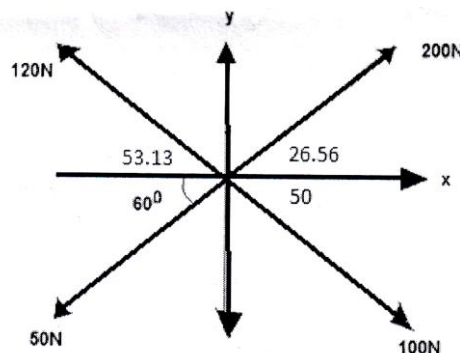
Instructions: 1) All questions are compulsory.
 2) Figures to right indicate full marks.

Section – I

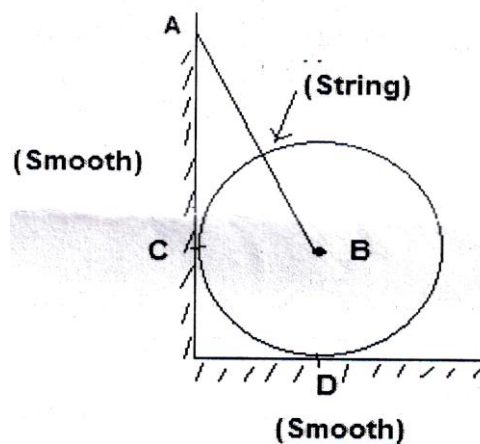
Q.2 Attempt any Four of the following questions.

12

- State & Explain Lamis Theorem.
- Explain couple & characteristics of couple.
- State assumption made in analysis of pin jointed truss.
- Determine the Resultant of the following force system.



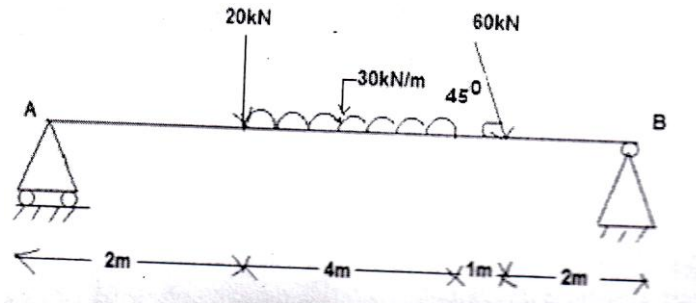
- Draw Free body diagram of sphere resting against smooth vertical wall & smooth floor. Having weight W supported by string AB.



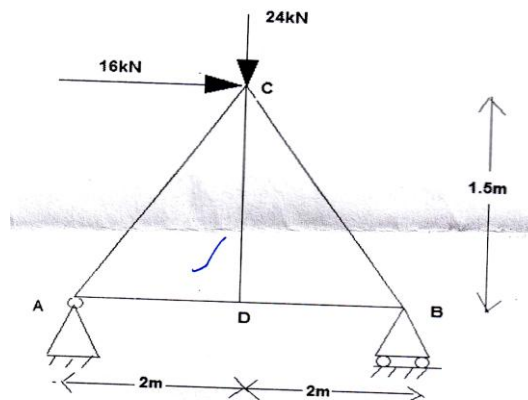
- Derive any two equations of Linear motion, with uniform accelerations.

Q.3 Attempt any Two of the following questions.

- a) Find the Reactions developed at support A & B of the beam as shown in fig.



- b) A projectile is fired at velocity of 800m/sec at angle 40° measured from the horizontal on level Ground. Determine.
- The total time of flight
 - Horizontal Range
 - The greatest height reached
 - Its Position after 35 Second
- c) Determine the forces in member of truss as shown in fig.



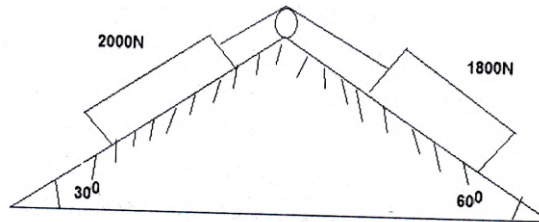
Section – II

Q.4 Attempt any Four of the following questions.

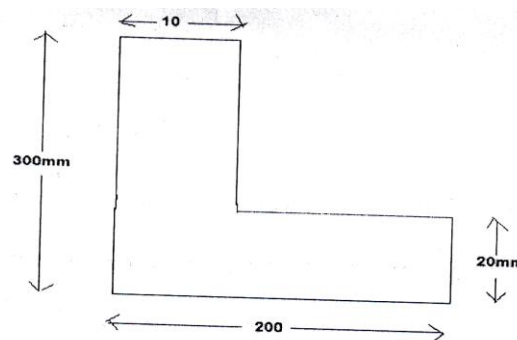
- Explain D Alembert Principle.
- Define
 - Torque
 - Mass moment of Inertia
 - Angular momentum
- Define
 - Work
 - Power
 - Energy
- Explain & prove Work-Energy equation.
- State parallel axis Theorem.
- State centroid & radius of gyration.

Q.5 Attempt any Two of the following questions.

- a) A mine cage weight 12kN & can carry a maximum load of 20kN. The average frictional resistance of the side guides is 500N. What constant cable tension is required to give loaded cage an upward velocity of 3m/sec, start from rest in the distance of 3m?
- b) Determine the time required for the weights as shown in fig. to attain a velocity of 9.81 m/sec. from rest. Take $\mu=0.2$ for both planes. Assume friction less pulley. Also Find tension in chord?



- c) Determine M-I about centroidal Horizontal axis & also determine radius of gyration about same axis. For following L section.



**Seat
No.**

Max. Marks: 70

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 - 4) Assume suitable data wherever needed & mention it clearly.
 - 5) Draw neat sketches wherever necessary.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Solve following Multiple-Choice Questions.

14

- 1) The process of finding the components is called _____.
a) Composition b) Resolution
c) Idealization d) Summation
- 2) The forces which meet at one point and have their lines of action in different planes are called _____.
a) Coplanar non-concurrent forces
b) Non-Coplanar concurrent forces
c) Non-Coplanar non-concurrent forces
d) None of these
- 3) For roller support number of unknown are _____.
a) one b) two
c) three d) none of these
- 4) In a perfect frame, relation between number of joints (j) and number of members (n) is given by _____.
a) $j = 2n - 3$ b) $n = 2j - 3$
c) $j = 2 - 3n$ d) $n = j - 6$
- 5) A beam 10 m long carries uniformly distributed load of 8 kN/m and supported at its two ends. What is the reaction at each support?
a) 8 kN b) 80 kN
c) 40 kN d) 4 kN
- 6) The area under v-t curve represents _____.
a) average velocity of particles
b) instantaneous velocity of particle
c) distance travelled by particle
d) acceleration of particle
- 7) When a ball is thrown in upward direction when it reaches maximum height its velocity will be _____.
a) maximum b) minimum
c) zero d) None of these

Seat No.	
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Set **P**

F.Y. (B Tech) (Sem - I) (New) (NEP CBCS) Examination: March/April-2024
Engineering Mechanics (BTCE0106) / (BTCSE0106)
/ (BTETE0106) / (BTEE0106) / (BTME0106)

Day & Date: Wednesday, 15-05-2024
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

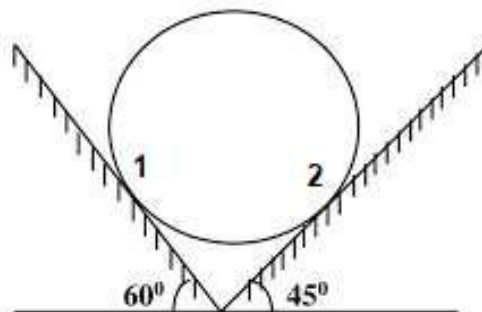
- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Assume suitable data wherever needed & mention it clearly.
 4) Draw neat sketches wherever necessary.

Section – I

Q.2 Attempt any four the following questions.

12

- State and derive Varignon's theorem of moment.
- Explain types of beam with neat sketches.
- Explain the term:
 - Perfect frame
 - Deficient frame
 - Redundant frame
- A 400 N sphere is resting in a trough as shown in figure. Determine reactions developed at contact surfaces. Assume all the contact surfaces are smooth.

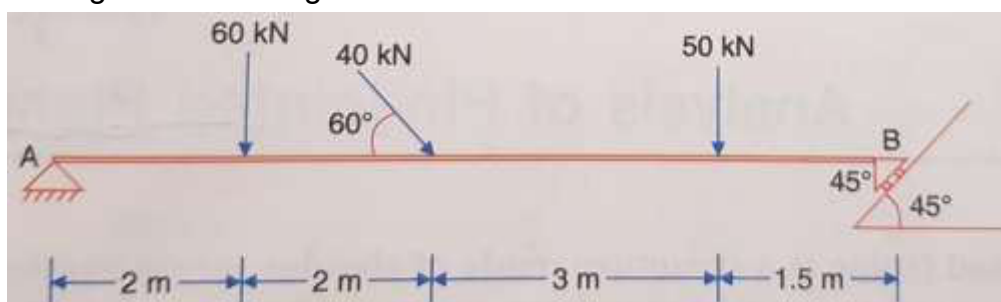


- Distinguish between angular motion and linear motion.
- Explain motion curves.

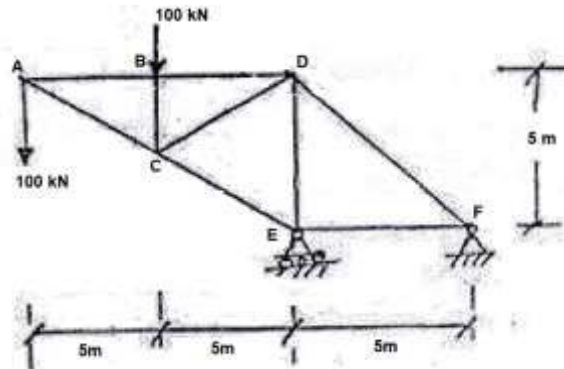
Q.3 Attempt any two the following questions.

16

- Beam AB, 8.5 m long, is hinged at A and has roller support at B. The roller support is inclined at 45° to the horizontal. Find the reactions at A and B, if loads acting are shown in figure



- b) Find the forces in all members by using method of joints.



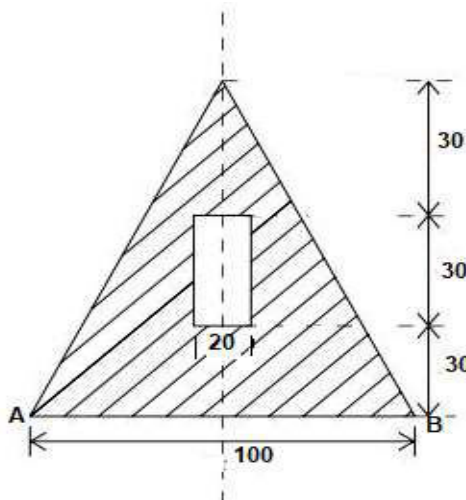
- c) The rotation of fly wheel is governed by the equation $\omega = 3t^2 - 2t + 2$. After one second from the start the angular displacement was 4 radians. Determine the angular displacement and angular velocity of the fly wheel $t = 3$ seconds.

Section – II

Q.4 Attempt any four of the following question.

12

- State and explain D' Alembert's principle of linear motion.
- What do you understand by the condition of dynamic equilibrium?
- Explain work energy principle.
- Define the terms
 - 1) Velocity of projection
 - 2) Angle of projection
 - 3) Horizontal Range
- State and prove perpendicular axes theorem.
- Determine the location of centroid of the lamina shown in Fig.

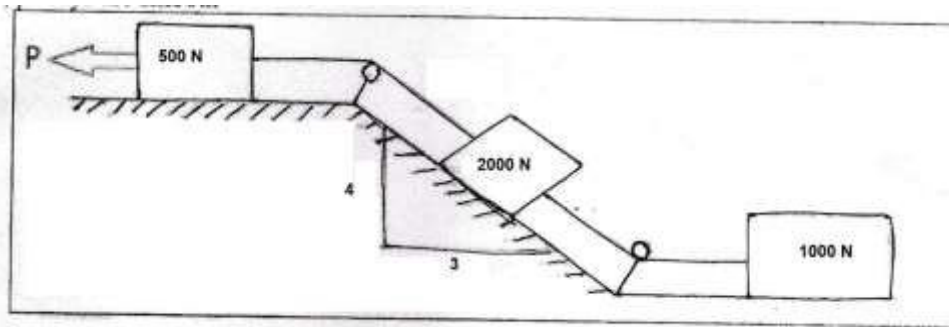


Q.5 Attempt any two of the following question.

16

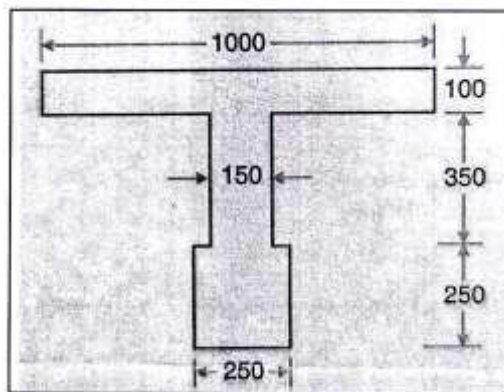
- An elevator cage of mine shaft weighing 8 kN, when empty, is lifted and lowered by means of a wire rope. Once man weighing, 600 N, entered it and lowered with uniform acceleration such that a distance of 187.5 m was covered, the velocity of the cage was 25 m/sec. Determine Tension in the rope and force exerted by the man on the floor.

- b) Determine the constant force P that will give the system of bodies as shown Figure, a velocity of 3 m/s after moving 4.5 m from the rest. Coefficient of friction between the blocks and plane is 0.3 , pulleys are smooth



Fig(v)

- c) Determine the polar moment of inertia about centroidal axes of the I-Section as shown in the figure. (All dimensions are in mm.)



Seat No.	
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Day & Date: Thursday, 13-07-2023
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book. Page no 03 (Starting page of the Answer Book). Each question carries one mark.

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- 3) Figures to the right indicates full marks.
- 4) Assume data wherever necessary.
- 5) Use of non-programmable calculator is allowed.

Duration: 30 Minutes

Marks:14

14

- 1) Method of splitting a given force into components without changing its effect on body is termed as _____.
a) composition b) resolution
c) both a and b d) None of these
- 2) If body doesn't deform under the application of external force then it's called as _____.
a) plastic body b) elastic body
c) rigid body d) none of these
- 3) In statics if body is in equilibrium means _____.
a) it doesn't translate b) it doesn't rotate
c) both a and b d) none of these
- 4) The minimum force required to slide a body of weight 'W' on a rough inclined plane is _____.
a) $W \sin \theta$ b) $W \cos \theta$
c) $W \tan \theta$ d) $W \operatorname{cosec} \theta$
- 5) Which axial force is determined while analysing a truss?
a) compressive force b) tensile force
c) both a and b d) none of the above
- 6) The M.I. of a rectangular section 3cm wide and 4cm deep about XX axis _____.
a) 9 cm^4 b) 12 cm^4
c) 16 cm^4 d) 20 cm^4
- 7) A horizontal acceleration-time curve represents _____.
a) change in velocity b) change in acceleration
c) uniform velocity d) None of these

- Page 2 of 20

Seat No.	
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Set **P**

F. Y. (B. Tech) (Sem - I) (New) (CBCS) Examination: March/April-2023
Engineering Mechanics (BTN10105)

Day & Date: Thursday, 13-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

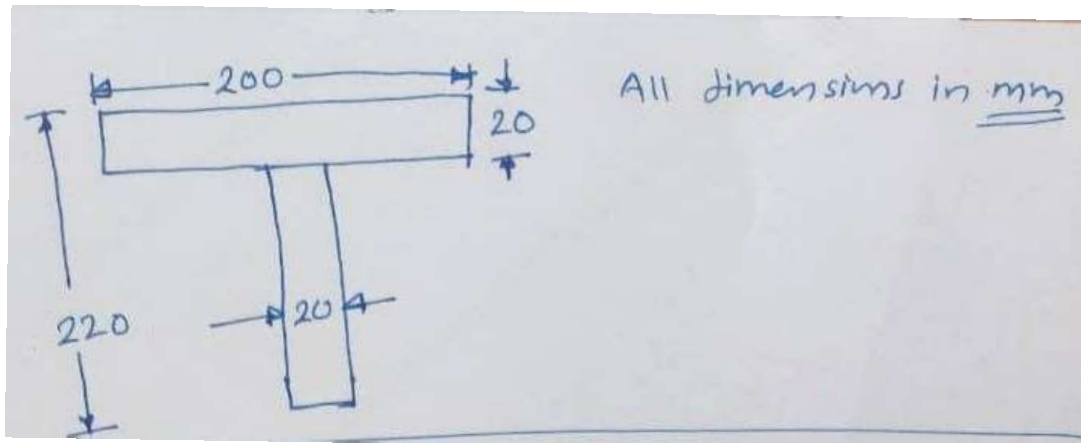
- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
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Section – I

Q.2 Attempt any four of the following.

12

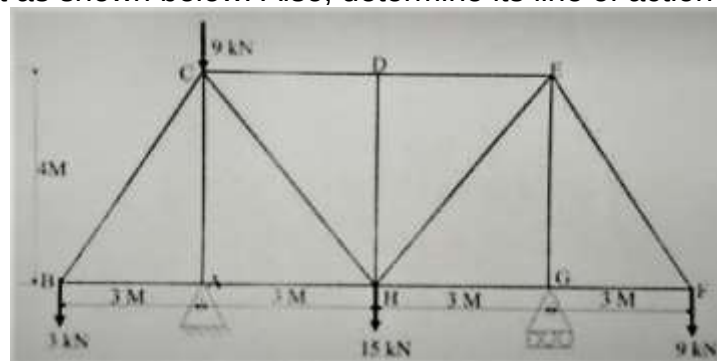
- State and explain law of transmissibility of forces.
- What are the different types of beams? Explain any two with neat sketches.
- A force required to pull a body of weight 100 N on rough horizontal plane is 30 N. Determine the coefficient of friction. If the force applied at an angle of 15° with horizontal plane.
- State and explain different laws of friction.
- What are the different types of trusses? Explain with neat sketches.
- Locate the centroid of lamina as shown below.



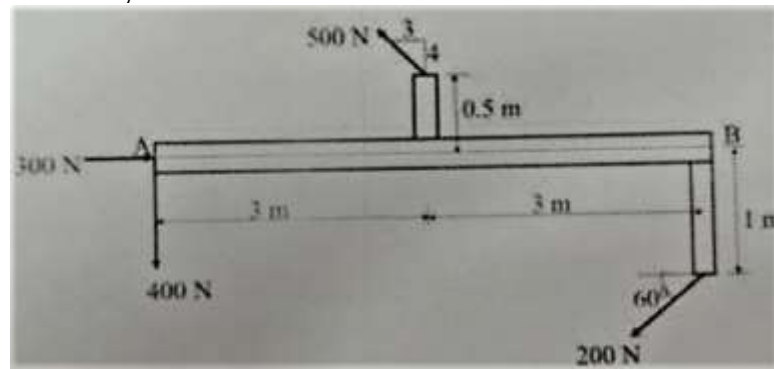
Q.3 Attempt any two of the following.

16

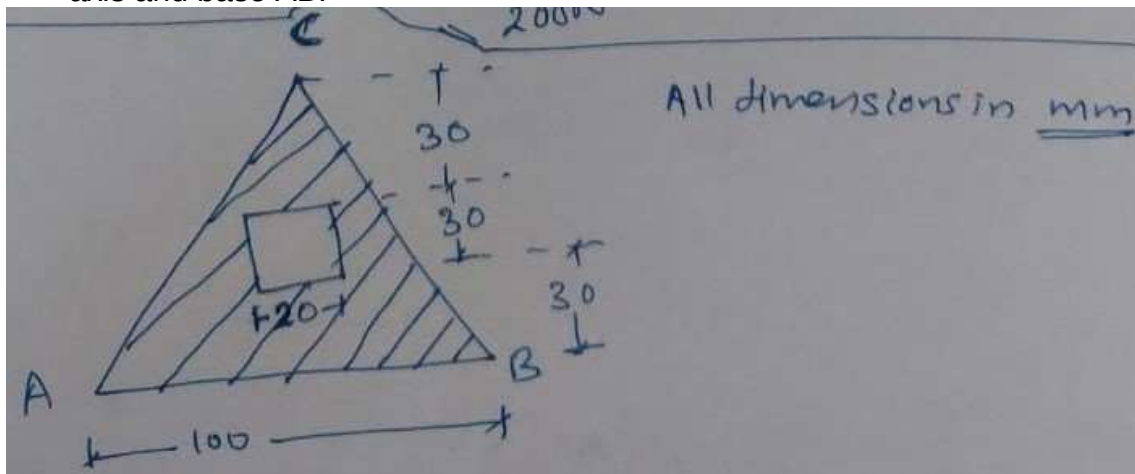
- Determine magnitude and direction of resultant force of force system acting on a bracket as shown below. Also, determine its line of action from point A.



- b) Determine forces in all the members of truss loaded and supported as shown below. Also, mention nature of forces.



- c) Locate the centroid of shaded region and find its MI about centroidal X-X axis and base AB.



Section – II

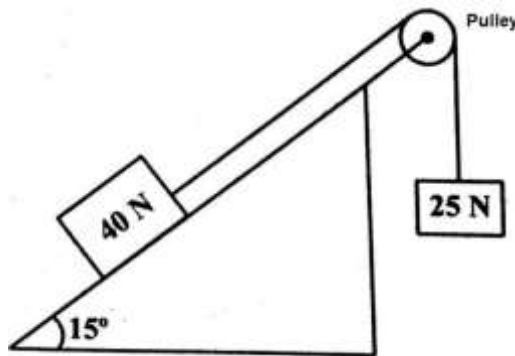
Q.4 Solve any four of the following questions

12

- Derive an expression of angular velocity with uniform acceleration ' α '
- The angular displacement of particle is given by relation $\theta = 2t^3 + 3t^2 + 10$ in radians. Determine the angular velocity and angular acceleration when $t = 4$ seconds. Also, state whether the acceleration is uniform or not.
- What will be the torque acting on a flywheel having mass 2 ton, radius 2m and rotating with uniform acceleration of 2 rad/s^2 ?
- State and derive work energy equation of linear motion.
- Two bodies, one of which is 400 N with a velocity of 8 m/s and other of 250 N with a velocity of 12 m/s, move towards each other along a straight line and impinge centrally. Find the velocity of each body after impact if the coefficient of restitution is 0.8.
- Define vibration, enlist its types and explain any one.

Q.5 Solve any two of the following questions

- a) A ball is dropped from top of tower 50 m high. At the same instant another ball is thrown upward from the ground with an initial velocity of 20 m/sec. when and where do they cross and with what velocities?
- b) Two bodies of weights 40 N and 25 N are connected to the two ends of a light inextensible string which passes over a smooth pulley. The weight 40 N is placed on a smooth inclined plane while the weight 25 N is hanging free in air. If the angle of the plane is 15° determine
- Acceleration of the system and
 - Tension in the string



- c) A bullet of mass 30 gm, moving horizontally with a velocity of 700 m/sec strikes a wooden block of mass 10 kg resting on rough horizontal surface. The bullet after striking the block remains buried in the block and both travel a distance of 90 cm, before coming to rest. Determine:
- average resistance between block and horizontal surface
 - co-efficient of friction between block and horizontal surface

Seat No.	
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Set **Q**

F. Y. (B. Tech) (Sem - I) (New) (CBCS) Examination: March/April-2023
Engineering Mechanics (BTN10105)

Day & Date: Thursday, 13-07-2023

Max. Marks: 70

Time: 10:00 AM To 01:00 PM

Instructions: 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book. Page no 03 (Starting page of the Answer Book). Each question carries one mark.

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4) Assume data wherever necessary.

5) Use of non-programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks:14

Q.1 Choose the correct alternatives from the given options.

14

- 1) If a velocity of car A and car B are 20 kmph and 10 kmph respectively moving towards each other then, relative velocity of car a with respect to car B will be _____.
 - a) 30 kmph
 - b) -10 kmph
 - c) 10 kmph
 - d) Zero
- 2) Two stones of mass 200 grams and 400 grams are released from a same point. If a stone of mass 200 grams takes 10 seconds to reach ground then, stone of mass 400 grams will take how many seconds to reach a ground.
 - a) 20 seconds
 - b) 5 seconds
 - c) 100 seconds
 - d) 10 seconds
- 3) Impulse momentum equation correlates _____.
 - a) force, acceleration, time, mass and velocity
 - b) force, displacement, mass and velocity
 - c) force, mass, time and velocity
 - d) force, mass and acceleration
- 4) Doubling the net force acting on an object _____.
 - a) Doubles its acceleration
 - b) Decreases its acceleration
 - c) Cuts its acceleration in half
 - d) Does not affect its acceleration
- 5) If velocity of object is increased by three times then its kinetic energy becomes _____.
 - a) nine times
 - b) 1.5 times
 - c) three times
 - d) remains same
- 6) A block weighing 18 N is lifted 7 m vertically upward. The potential energy stored in it is _____.
 - a) 126 J
 - b) 120 J
 - c) 130 J
 - d) 124 J

- 7) The work done on a body is zero when _____.
a) There is no displacement of the body
b) Resultant of forces acting on it is zero
c) The displacement is perpendicular to the direction of force
d) All of the above
- 8) Method of splitting a given force into components without changing its effect on body is termed as _____.
a) composition
b) resolution
c) both a and b
d) None of these
- 9) If body doesn't deform under the application of external force then it's called as _____.
a) plastic body
b) elastic body
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- 10) In statics if body is in equilibrium means _____.
a) it doesn't translate
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- 11) The minimum force required to slide a body of weight 'W' on a rough inclined plane is _____.
a) $W \sin \theta$
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- 12) Which axial force is determined while analysing a truss?
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b) tensile force
c) both a and b
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- 13) The M.I. of a rectangular section 3cm wide and 4cm deep about XX axis _____.
a) 9 cm^4
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c) 16 cm^4
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- 14) A horizontal acceleration-time curve represents _____.
a) change in velocity
b) change in acceleration
c) uniform velocity
d) None of these

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Set **Q**

F. Y. (B. Tech) (Sem - I) (New) (CBCS) Examination: March/April-2023
Engineering Mechanics (BTN10105)

Day & Date: Thursday, 13-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

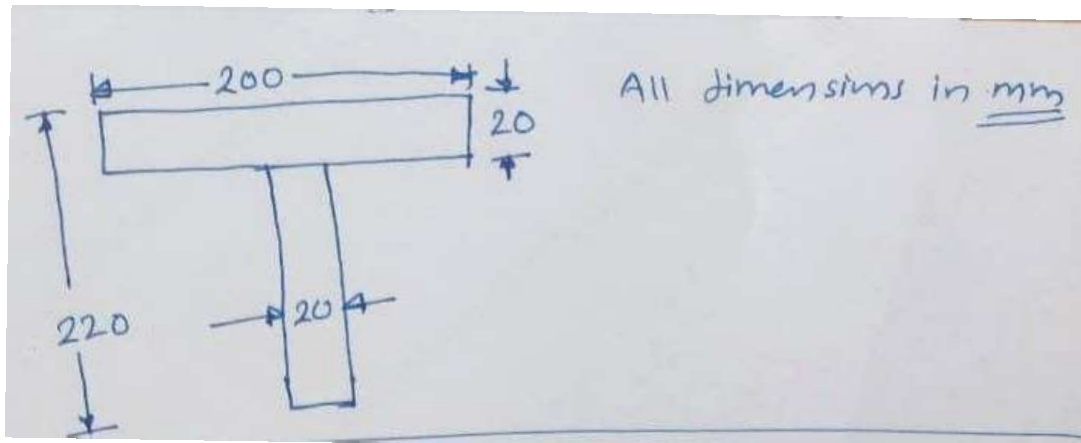
- Instructions:** 1) All questions are compulsory.
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 3) Use of Non-programmable calculator is allowed.

Section – I

Q.2 Attempt any four of the following.

12

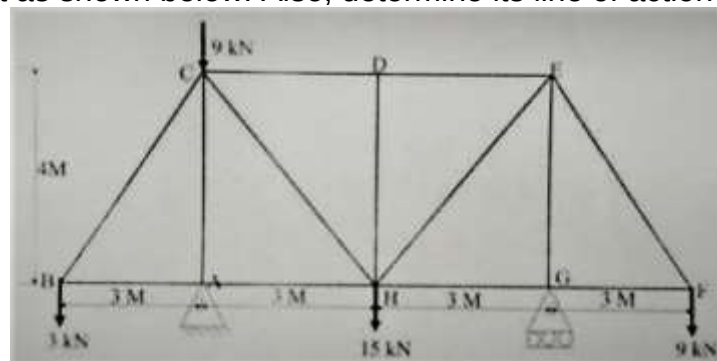
- State and explain law of transmissibility of forces.
- What are the different types of beams? Explain any two with neat sketches.
- A force required to pull a body of weight 100 N on rough horizontal plane is 30 N. Determine the coefficient of friction. If the force applied at an angle of 15° with horizontal plane.
- State and explain different laws of friction.
- What are the different types of trusses? Explain with neat sketches.
- Locate the centroid of lamina as shown below.



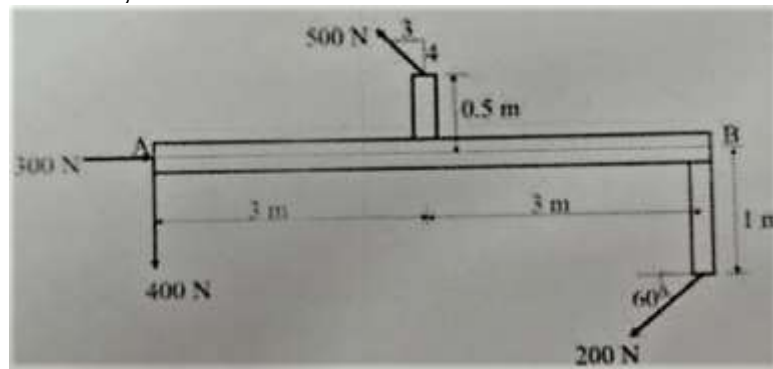
Q.3 Attempt any two of the following.

16

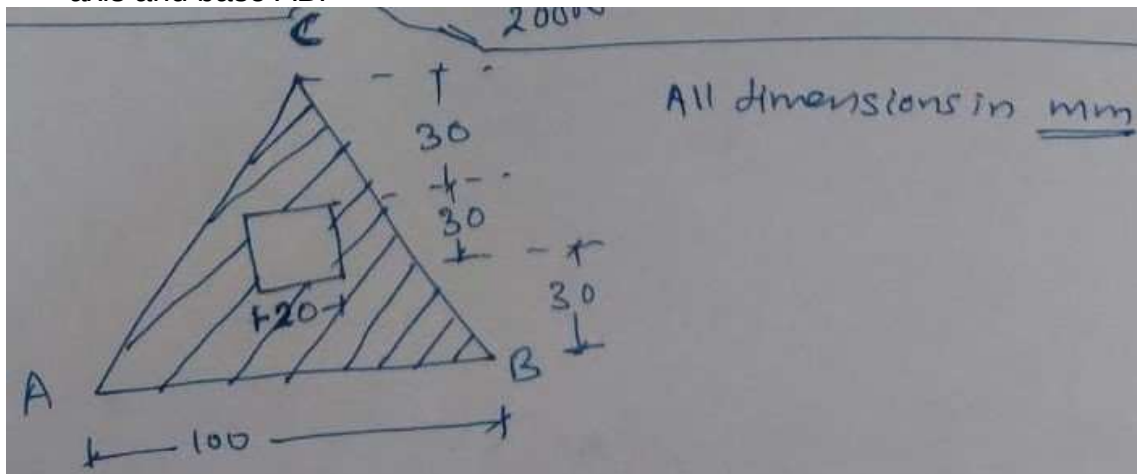
- Determine magnitude and direction of resultant force of force system acting on a bracket as shown below. Also, determine its line of action from point A.



- b) Determine forces in all the members of truss loaded and supported as shown below. Also, mention nature of forces.



- c) Locate the centroid of shaded region and find its MI about centroidal X-X axis and base AB.



Section – II

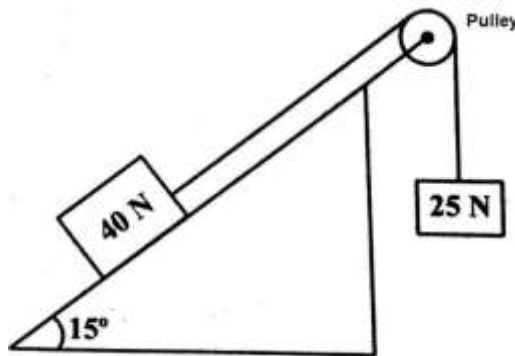
Q.4 Solve any four of the following questions

12

- Derive an expression of angular velocity with uniform acceleration ' α '
- The angular displacement of particle is given by relation $\theta = 2t^3 + 3t^2 + 10$ in radians. Determine the angular velocity and angular acceleration when $t = 4$ seconds. Also, state whether the acceleration is uniform or not.
- What will be the torque acting on a flywheel having mass 2 ton, radius 2m and rotating with uniform acceleration of 2 rad/s^2 ?
- State and derive work energy equation of linear motion.
- Two bodies, one of which is 400 N with a velocity of 8 m/s and other of 250 N with a velocity of 12 m/s, move towards each other along a straight line and impinge centrally. Find the velocity of each body after impact if the coefficient of restitution is 0.8.
- Define vibration, enlist its types and explain any one.

Q.5 Solve any two of the following questions

- a) A ball is dropped from top of tower 50 m high. At the same instant another ball is thrown upward from the ground with an initial velocity of 20 m/sec. when and where do they cross and with what velocities?
- b) Two bodies of weights 40 N and 25 N are connected to the two ends of a light inextensible string which passes over a smooth pulley. The weight 40 N is placed on a smooth inclined plane while the weight 25 N is hanging free in air. If the angle of the plane is 15° determine
- Acceleration of the system and
 - Tension in the string



- c) A bullet of mass 30 gm, moving horizontally with a velocity of 700 m/sec strikes a wooden block of mass 10 kg resting on rough horizontal surface. The bullet after striking the block remains buried in the block and both travel a distance of 90 cm, before coming to rest. Determine:
- average resistance between block and horizontal surface
 - co-efficient of friction between block and horizontal surface

Seat No.	
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Set R

F. Y. (B. Tech) (Sem - I) (New) (CBCS) Examination: March/April-2023
Engineering Mechanics (BTN10105)

Day & Date: Thursday, 13-07-2023

Max. Marks: 70

Time: 10:00 AM To 01:00 PM

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 - 5) Use of non-programmable calculator is allowed.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks:14

Q.1 Choose the correct alternatives from the given options.

14

- 1) Doubling the net force acting on an object _____.
 - a) Doubles its acceleration
 - b) Decreases its acceleration
 - c) Cuts its acceleration in half
 - d) Does not affect its acceleration
- 2) If velocity of object is increased by three times then its kinetic energy becomes _____.
 - a) nine times
 - b) 1.5 times
 - c) three times
 - d) remains same
- 3) A block weighing 18 N is lifted 7 m vertically upward. The potential energy stored in it is _____.
 - a) 126 J
 - b) 120 J
 - c) 130 J
 - d) 124 J
- 4) The work done on a body is zero when _____.
 - a) There is no displacement of the body
 - b) Resultant of forces acting on it is zero
 - c) The displacement is perpendicular to the direction of force
 - d) All of the above
- 5) Method of splitting a given force into components without changing its effect on body is termed as _____.
 - a) composition
 - b) resolution
 - c) both a and b
 - d) None of these
- 6) If body doesn't deform under the application of external force then it's called as _____.
 - a) plastic body
 - b) elastic body
 - c) rigid body
 - d) none of these
- 7) In statics if body is in equilibrium means _____.
 - a) it doesn't translate
 - b) it doesn't rotate
 - c) both a and b
 - d) none of these

Seat No.	
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Set **R**

F. Y. (B. Tech) (Sem - I) (New) (CBCS) Examination: March/April-2023
Engineering Mechanics (BTN10105)

Day & Date: Thursday, 13-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

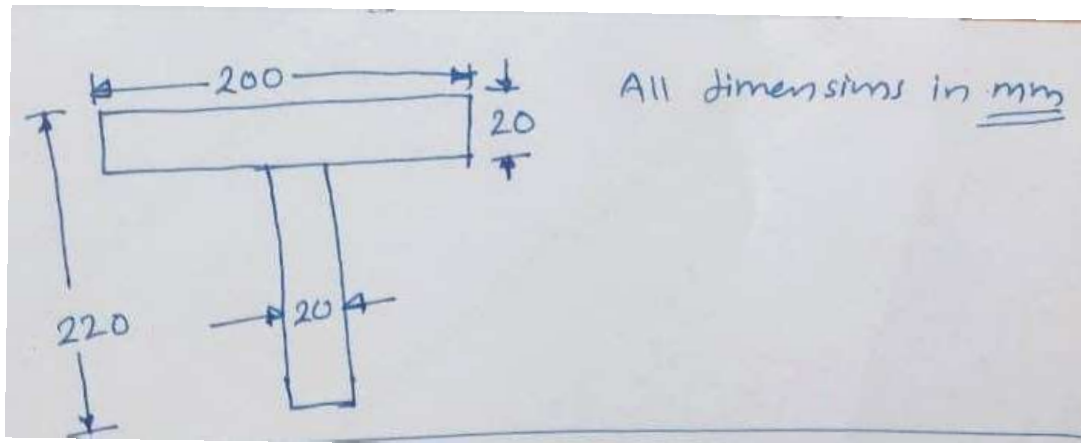
- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of Non-programmable calculator is allowed.

Section – I

Q.2 Attempt any four of the following.

12

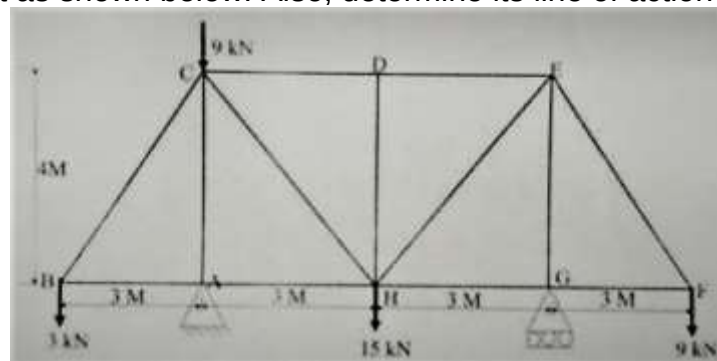
- State and explain law of transmissibility of forces.
- What are the different types of beams? Explain any two with neat sketches.
- A force required to pull a body of weight 100 N on rough horizontal plane is 30 N. Determine the coefficient of friction. If the force applied at an angle of 15° with horizontal plane.
- State and explain different laws of friction.
- What are the different types of trusses? Explain with neat sketches.
- Locate the centroid of lamina as shown below.



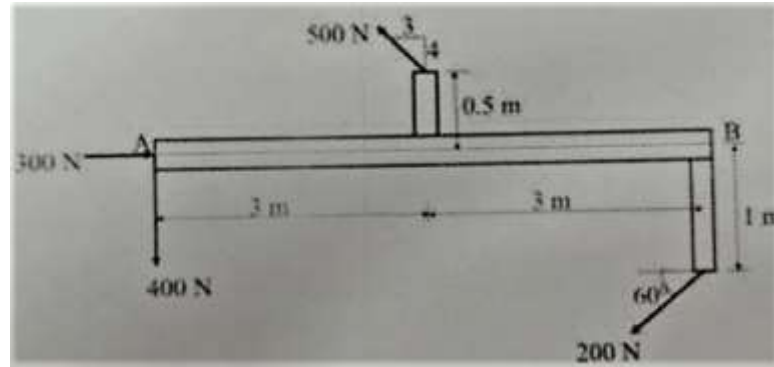
Q.3 Attempt any two of the following.

16

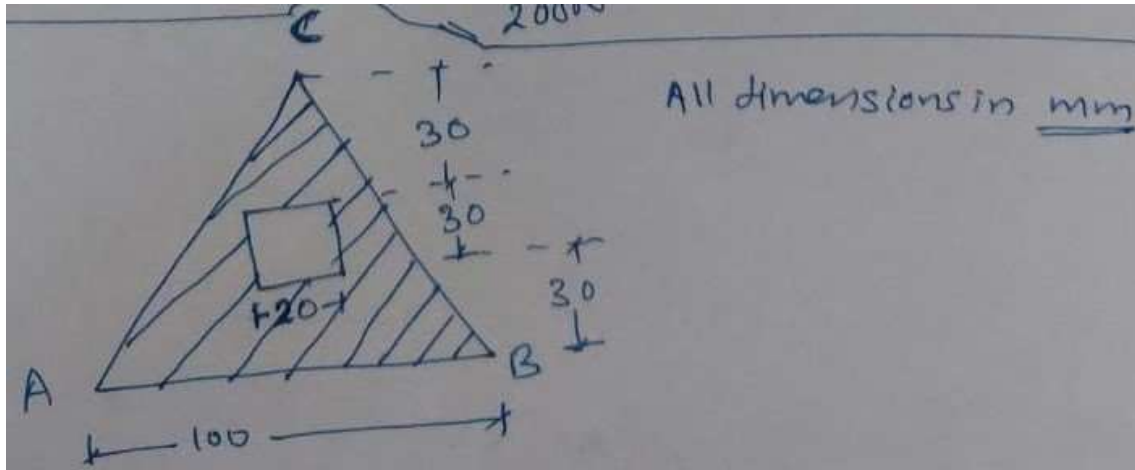
- Determine magnitude and direction of resultant force of force system acting on a bracket as shown below. Also, determine its line of action from point A.



- b) Determine forces in all the members of truss loaded and supported as shown below. Also, mention nature of forces.



- c) Locate the centroid of shaded region and find its MI about centroidal X-X axis and base AB.



Section – II

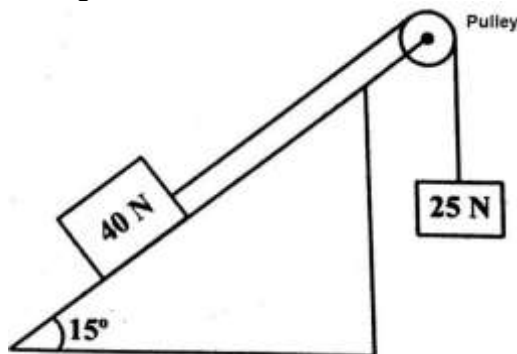
Q.4 Solve any four of the following questions

12

- Derive an expression of angular velocity with uniform acceleration ' α '
- The angular displacement of particle is given by relation $\theta = 2t^3 + 3t^2 + 10$ in radians. Determine the angular velocity and angular acceleration when $t = 4$ seconds. Also, state whether the acceleration is uniform or not.
- What will be the torque acting on a flywheel having mass 2 ton, radius 2m and rotating with uniform acceleration of 2 rad/s^2 ?
- State and derive work energy equation of linear motion.
- Two bodies, one of which is 400 N with a velocity of 8 m/s and other of 250 N with a velocity of 12 m/s, move towards each other along a straight line and impinge centrally. Find the velocity of each body after impact if the coefficient of restitution is 0.8.
- Define vibration, enlist its types and explain any one.

Q.5 Solve any two of the following questions

- a) A ball is dropped from top of tower 50 m high. At the same instant another ball is thrown upward from the ground with an initial velocity of 20 m/sec. when and where do they cross and with what velocities?
- b) Two bodies of weights 40 N and 25 N are connected to the two ends of a light inextensible string which passes over a smooth pulley. The weight 40 N is placed on a smooth inclined plane while the weight 25 N is hanging free in air. If the angle of the plane is 15° determine
- Acceleration of the system and
 - Tension in the string



- c) A bullet of mass 30 gm, moving horizontally with a velocity of 700 m/sec strikes a wooden block of mass 10 kg resting on rough horizontal surface. The bullet after striking the block remains buried in the block and both travel a distance of 90 cm, before coming to rest. Determine:
- average resistance between block and horizontal surface
 - co-efficient of friction between block and horizontal surface

Seat No.	
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Day & Date: Thursday, 13-07-2023
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicates full marks.
- 4) Assume data wherever necessary.
- 5) Use of non-programmable calculator is allowed.

Duration: 30 Minutes

Marks:14

14

- 1) The M.I. of a rectangular section 3cm wide and 4cm deep about XX axis _____.
a) 9 cm^4
b) 12 cm^4
c) 16 cm^4
d) 20 cm^4
- 2) A horizontal acceleration-time curve represents _____.
a) change in velocity
b) change in acceleration
c) uniform velocity
d) None of these
- 3) If a velocity of car A and car B are 20 kmph and 10 kmph respectively moving towards each other then, relative velocity of car a with respect to car B will be _____.
a) 30 kmph
b) -10 kmph
c) 10 kmph
d) Zero
- 4) Two stones of mass 200 grams and 400 grams are released from a same point. If a stone of mass 200 grams takes 10 seconds to reach ground then, stone of mass 400 grams will take how many seconds to reach a ground.
a) 20 seconds
b) 5 seconds
c) 100 seconds
d) 10 seconds
- 5) Impulse momentum equation correlates _____.
a) force, acceleration, time, mass and velocity
b) force, displacement, mass and velocity
c) force, mass, time and velocity
d) force, mass and acceleration
- 6) Doubling the net force acting on an object _____.
a) Doubles its acceleration
b) Decreases its acceleration
c) Cuts its acceleration in half
d) Does not affect its acceleration

Seat No.	
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Set **S**

F. Y. (B. Tech) (Sem - I) (New) (CBCS) Examination: March/April-2023
Engineering Mechanics (BTN10105)

Day & Date: Thursday, 13-07-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

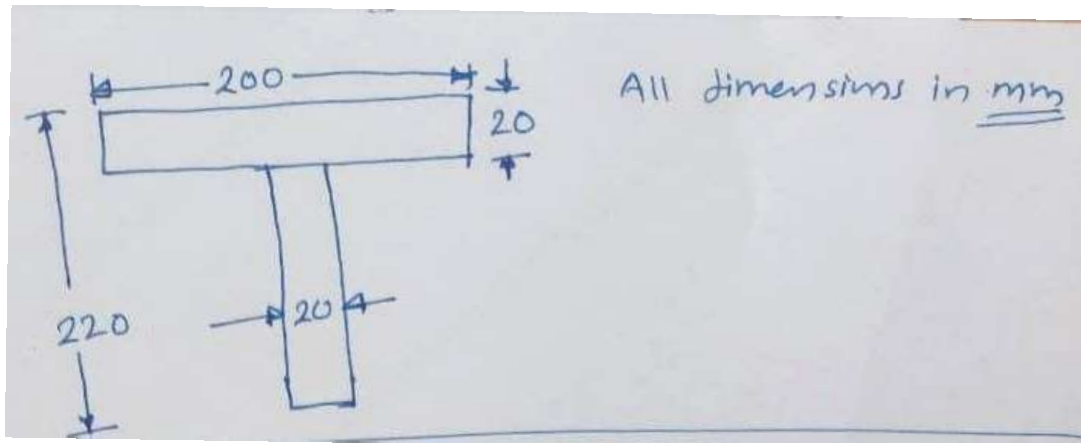
- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.
 3) Use of Non-programmable calculator is allowed.

Section – I

Q.2 Attempt any four of the following.

12

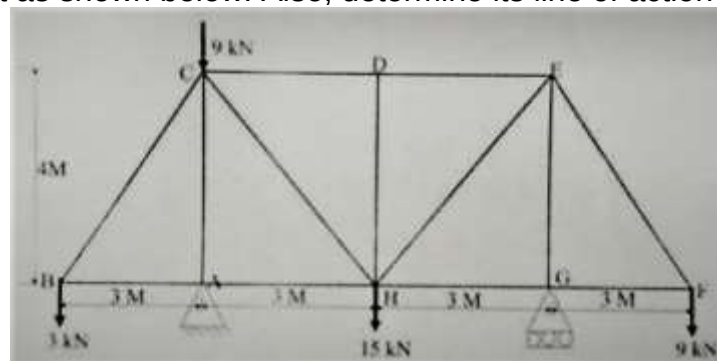
- State and explain law of transmissibility of forces.
- What are the different types of beams? Explain any two with neat sketches.
- A force required to pull a body of weight 100 N on rough horizontal plane is 30 N. Determine the coefficient of friction. If the force applied at an angle of 15° with horizontal plane.
- State and explain different laws of friction.
- What are the different types of trusses? Explain with neat sketches.
- Locate the centroid of lamina as shown below.



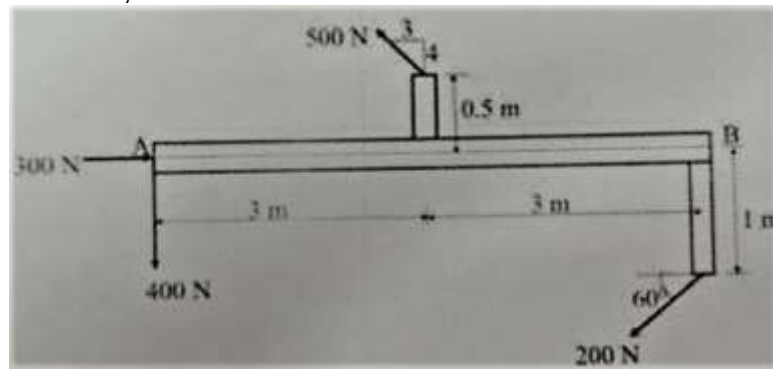
Q.3 Attempt any two of the following.

16

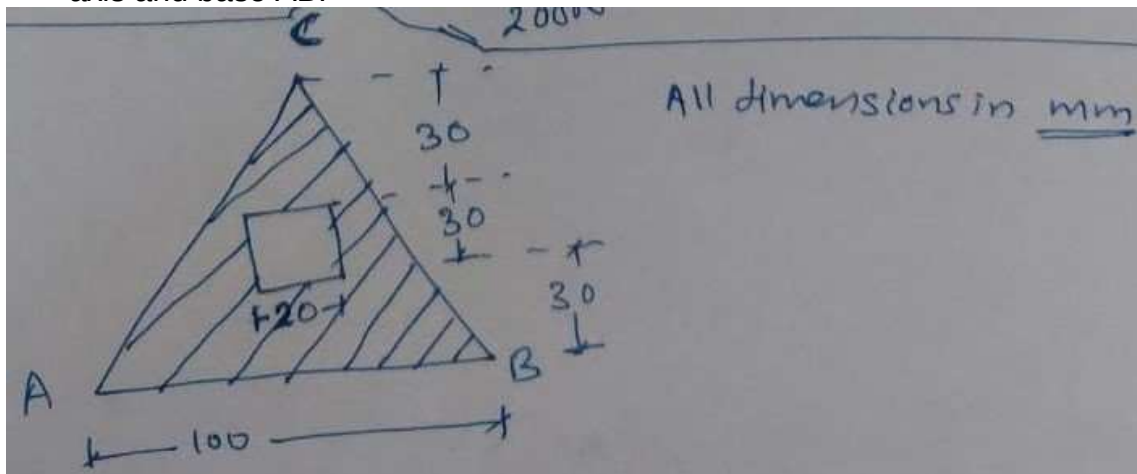
- Determine magnitude and direction of resultant force of force system acting on a bracket as shown below. Also, determine its line of action from point A.



- b) Determine forces in all the members of truss loaded and supported as shown below. Also, mention nature of forces.



- c) Locate the centroid of shaded region and find its MI about centroidal X-X axis and base AB.



Section – II

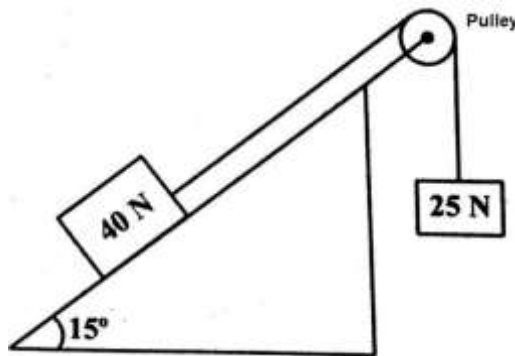
Q.4 Solve any four of the following questions

12

- Derive an expression of angular velocity with uniform acceleration ' α '
- The angular displacement of particle is given by relation $\theta = 2t^3 + 3t^2 + 10$ in radians. Determine the angular velocity and angular acceleration when $t = 4$ seconds. Also, state whether the acceleration is uniform or not.
- What will be the torque acting on a flywheel having mass 2 ton, radius 2m and rotating with uniform acceleration of 2 rad/s^2 ?
- State and derive work energy equation of linear motion.
- Two bodies, one of which is 400 N with a velocity of 8 m/s and other of 250 N with a velocity of 12 m/s, move towards each other along a straight line and impinge centrally. Find the velocity of each body after impact if the coefficient of restitution is 0.8.
- Define vibration, enlist its types and explain any one.

Q.5 Solve any two of the following questions

- a) A ball is dropped from top of tower 50 m high. At the same instant another ball is thrown upward from the ground with an initial velocity of 20 m/sec. when and where do they cross and with what velocities?
- b) Two bodies of weights 40 N and 25 N are connected to the two ends of a light inextensible string which passes over a smooth pulley. The weight 40 N is placed on a smooth inclined plane while the weight 25 N is hanging free in air. If the angle of the plane is 15° determine
- Acceleration of the system and
 - Tension in the string



- c) A bullet of mass 30 gm, moving horizontally with a velocity of 700 m/sec strikes a wooden block of mass 10 kg resting on rough horizontal surface. The bullet after striking the block remains buried in the block and both travel a distance of 90 cm, before coming to rest. Determine:
- average resistance between block and horizontal surface
 - co-efficient of friction between block and horizontal surface

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Max. Marks: 70

- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicates full marks
- 4) Assume suitable data wherever needed and mention it clearly.

Marks: 14

14

- Page 1 of 20

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov-2022
Engineering Mechanics

Day & Date: Monday, 20-03-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

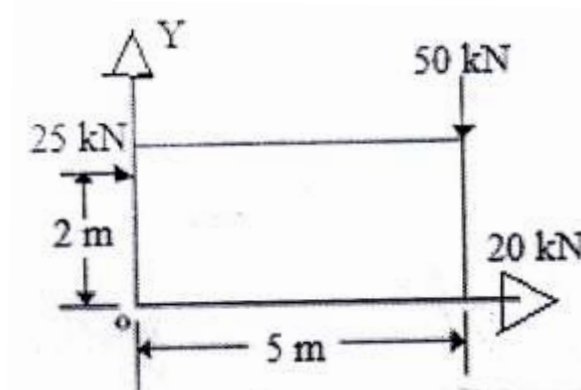
Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Answer the following question. (Any Four)

12

- State and explain Newton's laws of motion.
- Enlist any three systems of forces.
- Determine resultant and its direction of force system acting on body as shown below.

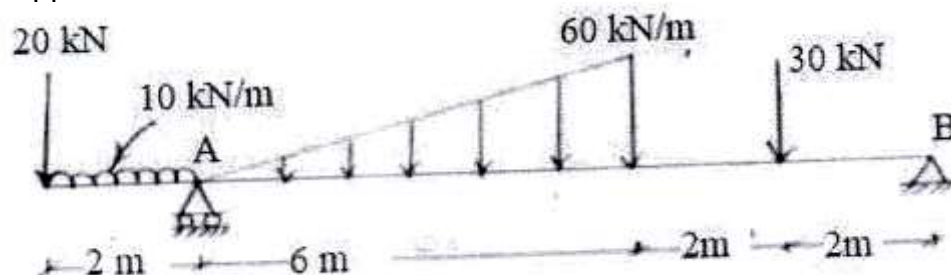


- A block of 200 N is resting on rough horizontal surface. To just slide the block a pull of 50 N is required. Determine coefficient of friction between surface of body and plane.
- Define centroid and moment of inertia.
- What is mean by couple moment? Enlist characteristics of couple moment.

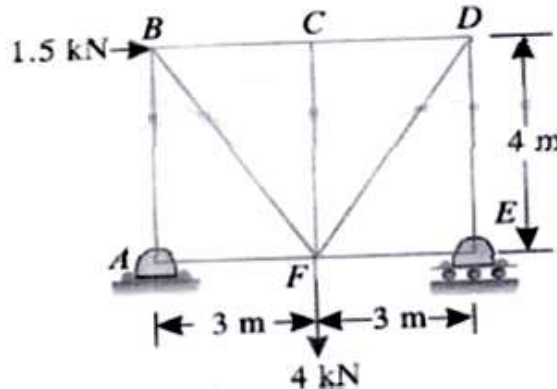
Q.3 Answer the following question. (Any Two)

16

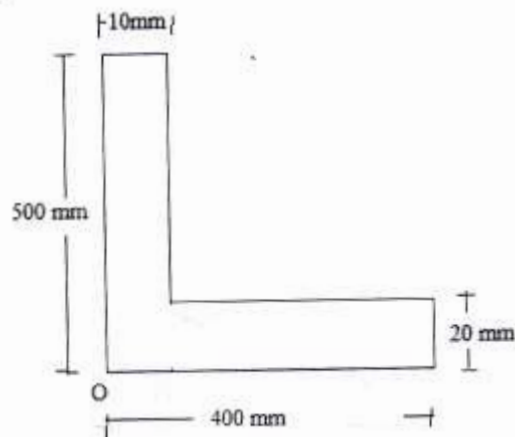
- Determine the support reactions for the beam which is loaded and supported as shown below.



- b) Determine forces and their nature in all the members of a truss which is loaded and supported as shown below.



- c) Locate centroid with respect to reference point O and determine the moment of inertia about polar axis for the L section as shown below



Section – II

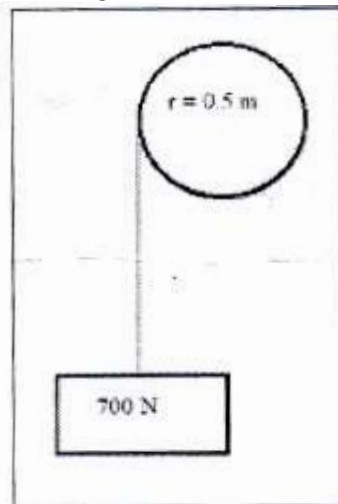
Q.4 Answer the following question. (Any Four)

12

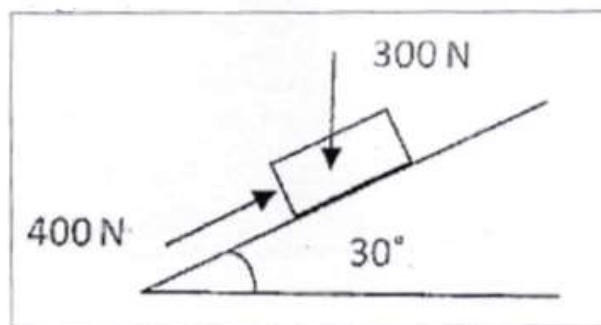
- Derive equations of linear motion with uniform acceleration.
- Define the following.
 - Angular velocity
 - Angular acceleration
 - Angular displacement
- A motorist is traveling at speed of 80 kmph suddenly applies brakes and halts after skidding 60 m if rate of retardation is 4.12 m/s^2 . Determine coefficient of friction between road and tyre. Use D'Alembert's principle.
- State and derive work energy equation.
- Initial velocity of two balls moving towards each other are 10 m/s and 4 m/s respectively and their velocities after collision are 4 m/s and 10 m/s respectively. Determine coefficient of restitution.
- State and explain types of vibration.

Q.5 Answer the following question. (Any Two)

- a) Angular acceleration of flywheel is given by $\alpha = 12 - t$ where, α is in radians and t is in seconds. If the angular velocity of flywheel is 60 rad/sec at the end of 4 seconds. Determine,
- 1) Angular velocity at the end of 6 seconds.
 - 2) Angular acceleration in 13th second
 - 3) Number of revolutions at the end of 6 seconds
- b) A pulley of weight 500 N has a radius of 0.5 m. A block weighing 700 N is suspended by a tight rope wound round the pulley the other end being attached to the pulley as shown in below in fig below. Determine the resulting acceleration of the weight and the tension in the rope.



- c) A body weighing 300 N is pushed up a 30° plane by a 400 N force acting parallel to the plane as shown in below. If the initial velocity of the body is 1.5 m/sec. and coefficient of kinetic friction is = 0.2, what velocity will the body have after moving 6 m? Use work energy method.



**Seat
No.**

Max. Marks: 70

- 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
- 3) Figures to the right indicates full marks
- 4) Assume suitable data wherever needed and mention it clearly.

Marks: 14

14

- Page 6 of 20

- 8)** Ideal condition(s) assumed in engineering mechanics is (are) _____.
a) Body is rigid b) Body is continuum
c) both a and b d) Body is plastic
- 9)** Capital letters used to indicate spaces between forces is termed as _____.
a) Newton's Letters b) Varignon's notations
c) Bow's notations d) All of these
- 10)** A force can be resolved in to _____.
a) n components b) a force and couple moment
c) both a and b d) only two components
- 11)** If a given truss satisfies mathematical condition $m = 2j - 3$ then the truss is _____.
a) redundant b) deficient
c) imperfect d) perfect
- 12)** To start the analysis of truss by method of joints the number of unknown must not be more than _____.
a) two b) three
c) either two or three d) four
- 13)** A point at which whole area of lamina is supposed to be concentrated is called as _____.
a) centre of gravity b) centroid
c) centre of mass d) none of these
- 14)** If axis of symmetry exist then it passes through the _____.
a) centre b) base
c) top of web d) side of flange

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov-2022
Engineering Mechanics

Day & Date: Monday, 20-03-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

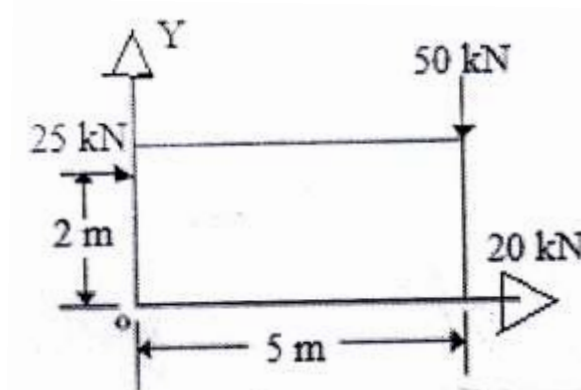
Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Answer the following question. (Any Four)

12

- State and explain Newton's laws of motion.
- Enlist any three systems of forces.
- Determine resultant and its direction of force system acting on body as shown below.

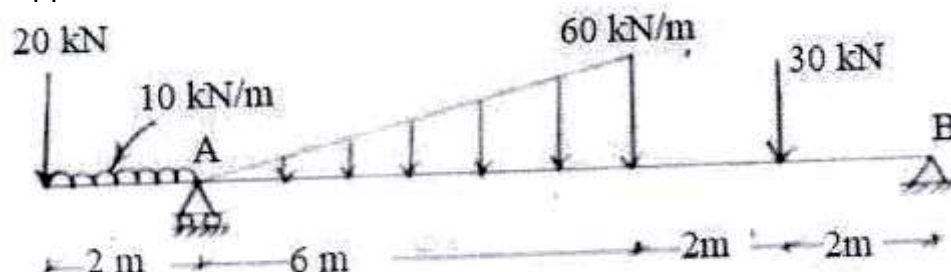


- A block of 200 N is resting on rough horizontal surface. To just slide the block a pull of 50 N is required. Determine coefficient of friction between surface of body and plane.
- Define centroid and moment of inertia.
- What is mean by couple moment? Enlist characteristics of couple moment.

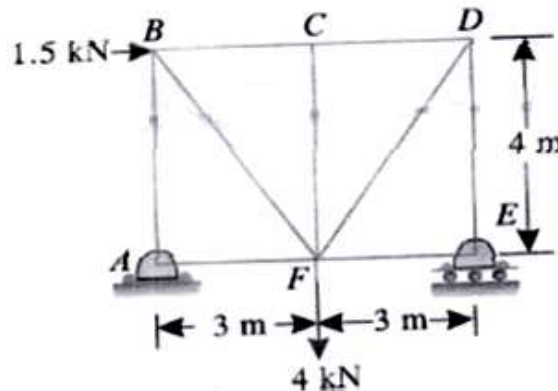
Q.3 Answer the following question. (Any Two)

16

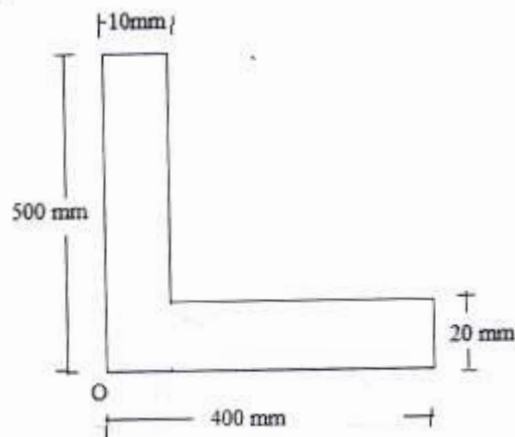
- Determine the support reactions for the beam which is loaded and supported as shown below.



- b) Determine forces and their nature in all the members of a truss which is loaded and supported as shown below.



- c) Locate centroid with respect to reference point O and determine the moment of inertia about polar axis for the L section as shown below



Section – II

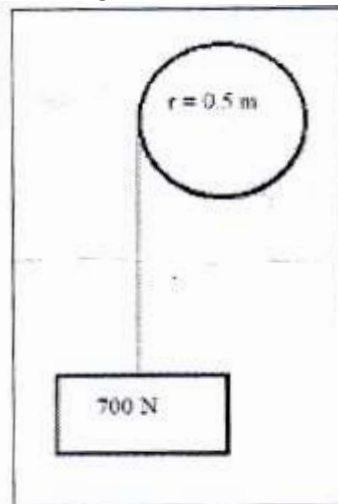
Q.4 Answer the following question. (Any Four)

12

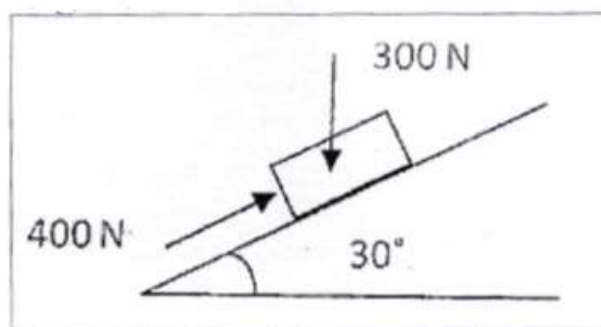
- Derive equations of linear motion with uniform acceleration.
- Define the following.
 - Angular velocity
 - Angular acceleration
 - Angular displacement
- A motorist is traveling at speed of 80 kmph suddenly applies brakes and halts after skidding 60 m if rate of retardation is 4.12 m/s^2 . Determine coefficient of friction between road and tyre. Use D'Alembert's principle.
- State and derive work energy equation.
- Initial velocity of two balls moving towards each other are 10 m/s and 4 m/s respectively and their velocities after collision are 4 m/s and 10 m/s respectively. Determine coefficient of restitution.
- State and explain types of vibration.

Q.5 Answer the following question. (Any Two)

- a)** Angular acceleration of flywheel is given by $\alpha = 12 - t$ where, α is in radians and t is in seconds. If the angular velocity of flywheel is 60 rad/sec at the end of 4 seconds. Determine,
- 1) Angular velocity at the end of 6 seconds.
 - 2) Angular acceleration in 13th second
 - 3) Number of revolutions at the end of 6 seconds
- b)** A pulley of weight 500 N has a radius of 0.5 m. A block weighing 700 N is suspended by a tight rope wound round the pulley the other end being attached to the pulley as shown in below in fig below. Determine the resulting acceleration of the weight and the tension in the rope.



- c)** A body weighing 300 N is pushed up a 30° plane by a 400 N force acting parallel to the plane as shown in below. If the initial velocity of the body is 1.5 m/sec. and coefficient of kinetic friction is = 0.2, what velocity will the body have after moving 6 m? Use work energy method.



Seat No.	
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Set **R**

F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov-2022
Engineering Mechanics

Day & Date: Monday, 20-03-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 70

- Instructions:** 1) Q. No. 1 is compulsory. It should be solved in the first 30 minutes in answer book. Page no 03 (Starting page of the Answer Book). Each question carries one mark.
 2) Don't forget to Mention question paper set (P/Q/R/S) on top of page.
 3) Figures to the right indicates full marks
 4) Assume suitable data wherever needed and mention it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options.

14

- 1) Inertia force during retardation acts in _____.
 a) Same direction of motion
 b) Opposite direction of motion
 c) Perpendicular to direction of motion
 d) Both a and b
- 2) 100 rpm is equivalent to _____.
 a) 10.467 rad/sec
 b) 628 rad/sec
 c) 1.667 rad/sec
 d) 955.414 rad/sec
- 3) Potential energy of body at height h from ground is 2 unit then its kinetic energy when it reaches at ground is _____.
 a) 16 unit
 b) 4 unit
 c) 2 unit
 d) 0
- 4) Centroidal rotation is rotation of body about _____.
 a) Axis parallel to its centroidal axis
 b) axis perpendicular to its plane of rotation and passing through its centre
 c) both a and b
 d) none of these
- 5) Ideal condition(s) assumed in engineering mechanics is (are) _____.
 a) Body is rigid
 b) Body is continuum
 c) both a and b
 d) Body is plastic
- 6) Capital letters used to indicate spaces between forces is termed as _____.
 a) Newton's Letters
 b) Varignon's notations
 c) Bow's notations
 d) All of these
- 7) A force can be resolved in to _____.
 a) n components
 b) a force and couple moment
 c) both a and b
 d) only two components
- 8) If a given truss satisfies mathematical condition $m = 2j - 3$ then the truss is _____.
 a) redundant
 b) deficient
 c) imperfect
 d) perfect

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov-2022
Engineering Mechanics

Day & Date: Monday, 20-03-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

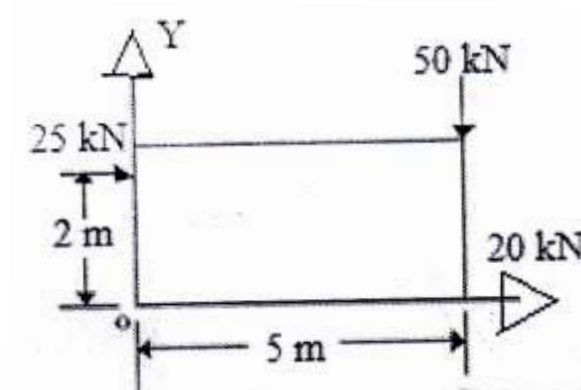
- Instructions:** 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Answer the following question. (Any Four)

12

- State and explain Newton's laws of motion.
- Enlist any three systems of forces.
- Determine resultant and its direction of force system acting on body as shown below.

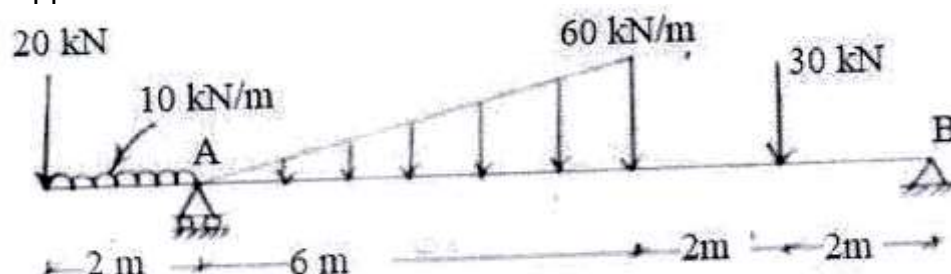


- A block of 200 N is resting on rough horizontal surface. To just slide the block a pull of 50 N is required. Determine coefficient of friction between surface of body and plane.
- Define centroid and moment of inertia.
- What is mean by couple moment? Enlist characteristics of couple moment.

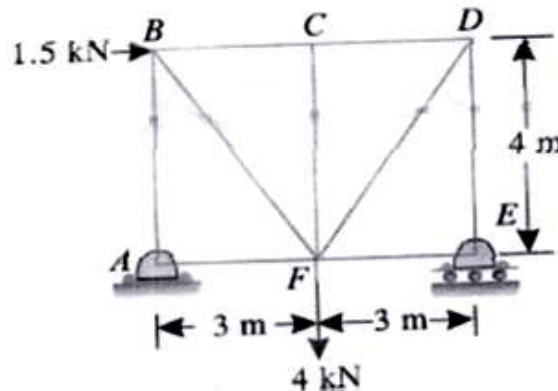
Q.3 Answer the following question. (Any Two)

16

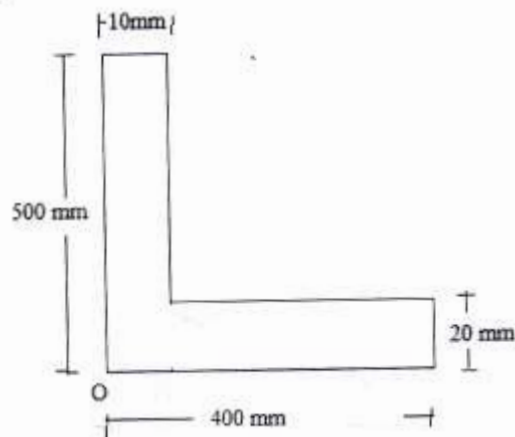
- Determine the support reactions for the beam which is loaded and supported as shown below.



- b) Determine forces and their nature in all the members of a truss which is loaded and supported as shown below.



- c) Locate centroid with respect to reference point O and determine the moment of inertia about polar axis for the L section as shown below



Section – II

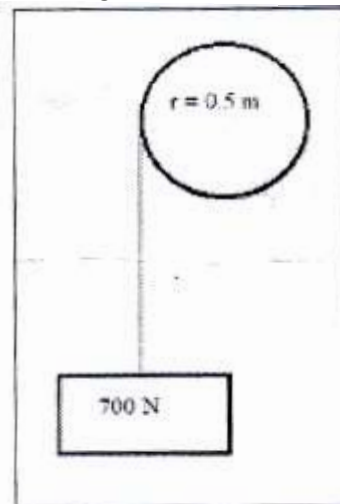
Q.4 Answer the following question. (Any Four)

12

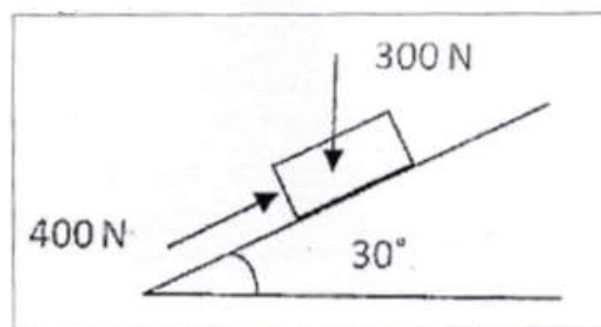
- Derive equations of linear motion with uniform acceleration.
- Define the following.
 - Angular velocity
 - Angular acceleration
 - Angular displacement
- A motorist is traveling at speed of 80 kmph suddenly applies brakes and halts after skidding 60 m if rate of retardation is 4.12 m/s^2 . Determine coefficient of friction between road and tyre. Use D'Alembert's principle.
- State and derive work energy equation.
- Initial velocity of two balls moving towards each other are 10 m/s and 4 m/s respectively and their velocities after collision are 4 m/s and 10 m/s respectively. Determine coefficient of restitution.
- State and explain types of vibration.

Q.5 Answer the following question. (Any Two)

- a) Angular acceleration of flywheel is given by $\alpha = 12 - t$ where, α is in radians and t is in seconds. If the angular velocity of flywheel is 60 rad/sec at the end of 4 seconds. Determine,
- 1) Angular velocity at the end of 6 seconds.
 - 2) Angular acceleration in 13th second
 - 3) Number of revolutions at the end of 6 seconds
- b) A pulley of weight 500 N has a radius of 0.5 m. A block weighing 700 N is suspended by a tight rope wound round the pulley the other end being attached to the pulley as shown in below in fig below. Determine the resulting acceleration of the weight and the tension in the rope.



- c) A body weighing 300 N is pushed up a 30° plane by a 400 N force acting parallel to the plane as shown in below. If the initial velocity of the body is 1.5 m/sec. and coefficient of kinetic friction is = 0.2, what velocity will the body have after moving 6 m? Use work energy method.



**Seat
No.**

Max. Marks: 70

Marks: 14

14

- Page 16 of 20

- 9) Centroidal rotation is rotation of body about _____.
a) Axis parallel to its centroidal axis
b) axis perpendicular to its plane of rotation and passing through its centre
c) both a and b
d) none of these
- 10) Ideal condition(s) assumed in engineering mechanics is (are) _____.
a) Body is rigid
b) Body is continuum
c) both a and b
d) Body is plastic
- 11) Capital letters used to indicate spaces between forces is termed as _____.
a) Newton's Letters
b) Varignon's notations
c) Bow's notations
d) All of these
- 12) A force can be resolved in to _____.
a) n components
b) a force and couple moment
c) both a and b
d) only two components
- 13) If a given truss satisfies mathematical condition $m = 2j - 3$ then the truss is _____.
a) redundant
b) deficient
c) imperfect
d) perfect
- 14) To start the analysis of truss by method of joints the number of unknown must not be more than _____.
a) two
b) three
c) either two or three
d) four

Seat No.	
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F.Y. (B.Tech.) (Sem - I) (New) (CBCS) Examination: Oct/Nov-2022
Engineering Mechanics

Day & Date: Monday, 20-03-2023
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

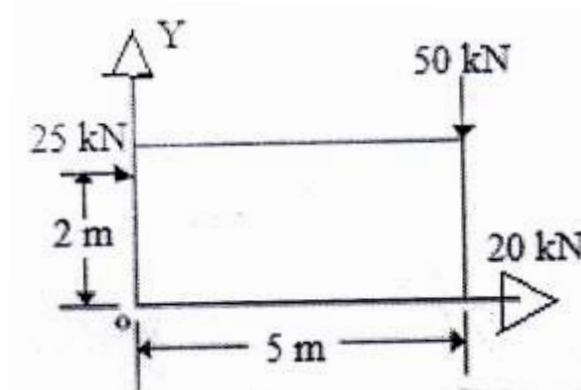
Instructions: 1) All questions are compulsory.
 2) Figures to the right indicate full marks.

Section – I

Q.2 Answer the following question. (Any Four)

12

- State and explain Newton's laws of motion.
- Enlist any three systems of forces.
- Determine resultant and its direction of force system acting on body as shown below.

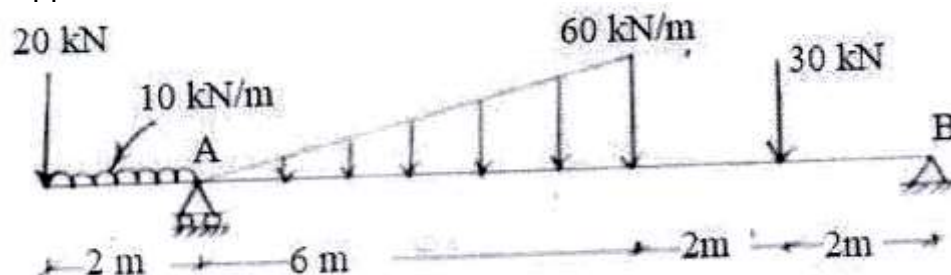


- A block of 200 N is resting on rough horizontal surface. To just slide the block a pull of 50 N is required. Determine coefficient of friction between surface of body and plane.
- Define centroid and moment of inertia.
- What is mean by couple moment? Enlist characteristics of couple moment.

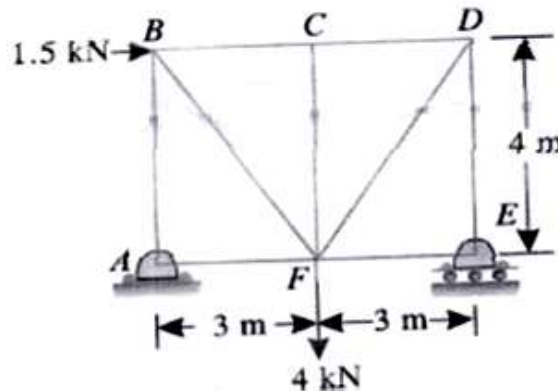
Q.3 Answer the following question. (Any Two)

16

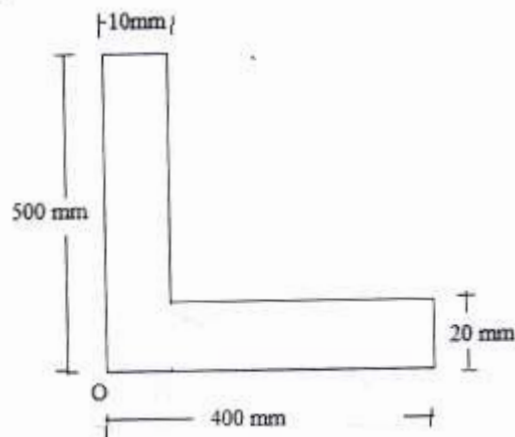
- Determine the support reactions for the beam which is loaded and supported as shown below.



- b) Determine forces and their nature in all the members of a truss which is loaded and supported as shown below.



- c) Locate centroid with respect to reference point O and determine the moment of inertia about polar axis for the L section as shown below



Section – II

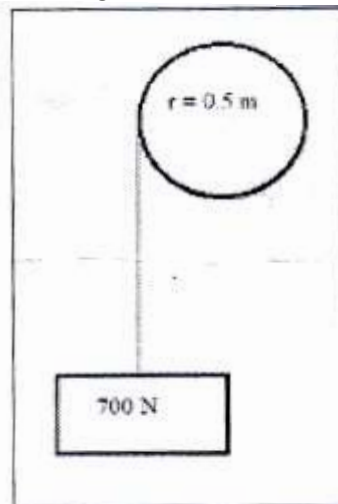
Q.4 Answer the following question. (Any Four)

12

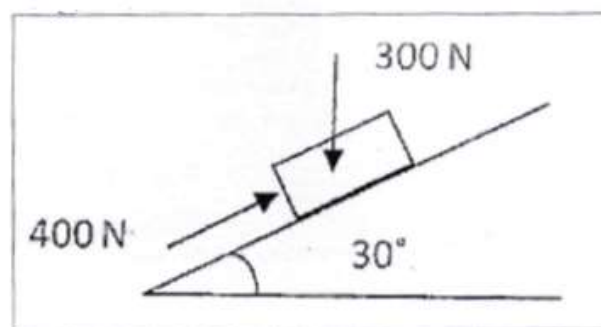
- Derive equations of linear motion with uniform acceleration.
- Define the following.
 - Angular velocity
 - Angular acceleration
 - Angular displacement
- A motorist is traveling at speed of 80 kmph suddenly applies brakes and halts after skidding 60 m if rate of retardation is 4.12 m/s^2 . Determine coefficient of friction between road and tyre. Use D'Alembert's principle.
- State and derive work energy equation.
- Initial velocity of two balls moving towards each other are 10 m/s and 4 m/s respectively and their velocities after collision are 4 m/s and 10 m/s respectively. Determine coefficient of restitution.
- State and explain types of vibration.

Q.5 Answer the following question. (Any Two)

- a) Angular acceleration of flywheel is given by $\alpha = 12 - t$ where, α is in radians and t is in seconds. If the angular velocity of flywheel is 60 rad/sec at the end of 4 seconds. Determine,
- 1) Angular velocity at the end of 6 seconds.
 - 2) Angular acceleration in 13th second
 - 3) Number of revolutions at the end of 6 seconds
- b) A pulley of weight 500 N has a radius of 0.5 m. A block weighing 700 N is suspended by a tight rope wound round the pulley the other end being attached to the pulley as shown in below in fig below. Determine the resulting acceleration of the weight and the tension in the rope.



- c) A body weighing 300 N is pushed up a 30° plane by a 400 N force acting parallel to the plane as shown in below. If the initial velocity of the body is 1.5 m/sec. and coefficient of kinetic friction is = 0.2, what velocity will the body have after moving 6 m? Use work energy method.



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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
Time: 10:00 AM To 01:00 PM

Max. Marks: 70

Instructions: 1) Q. No. 1 is compulsory and it should be solved in first 30 minutes in answer book.

- 2) Use of non programmable scientific calculator allowed.
- 3) Figures to the right indicate full marks.
- 4) Assume suitable data if necessary and state it clearly.

MCQ/Objective Type Questions

Duration: 30 Minutes

Marks: 14

Q.1 Choose the correct alternatives from the options and rewrite the sentence. 14

- 1) Composition of forces is nothing but _____.
 - a) splitting of forces
 - b) finding resultant forces
 - c) both a & b are correct
 - d) none of these
- 2) 1 Kg force is equal to _____.
 - a) 7.5 N
 - b) 8.91 N
 - c) 9.81 N
 - d) 8.55 N
- 3) Angle made by resultant of normal reaction and frictional force with vertical is called as _____.
 - a) angle of friction
 - b) angle of repose
 - c) both a & b
 - d) cone of friction
- 4) A couple produces _____.
 - a) translatory motion
 - b) rotational motion
 - c) both translation & rotation
 - d) no motion
- 5) A framed structure of triangular shape is _____.
 - a) perfect
 - b) imperfect
 - c) deficient
 - d) redundant
- 6) The geometrical center of lamina through which all area is supposed to be acting is called as _____.
 - a) center of gravity
 - b) center of mass
 - c) center of inertia
 - d) centroid
- 7) The M.I of a triangular section of base (b) & height (h) about on axis through it's base is given as _____.
 - a) $bh^3/12$
 - b) $bh^3/18$
 - c) $bh^3/36$
 - d) $bh^3/64$

- 8) If gravitational acceleration at any place is doubled then weight of body will be _____.
 - a) $g/2$
 - b) g
 - c) $\sqrt{2}g$
 - d) $2g$
- 9) In a rectilinear motion all the particles in body _____.
 - a) have same displacement
 - b) have some velocity
 - c) have some acceleration
 - d) all of these
- 10) D'Alembert's principle correlates _____.
 - a) force, mass, velocity, and displacement
 - b) force, mass, and acceleration
 - c) force, time, mass and velocity
 - d) mass and velocity
- 11) Angular momentum is the product of _____.
 - a) mass moment of inertia x angular velocity
 - b) mass moment of inertia x angular acceleration
 - c) mass normal of inertia x angular displacement
 - d) none of these
- 12) The time rate of doing work is known as _____.
 - a) potential energy
 - b) kinetic energy
 - c) rotational energy
 - d) power
- 13) The bodies which regains their size and shape after impact are called _____.
 - a) plastic bodies
 - b) rigid bodies
 - c) elastic bodies
 - d) partially plastic bodied
- 14) Impulse is measured in _____.
 - a) N – sec
 - b) N /sec
 - c) N/ sec²
 - d) N

Seat No.	
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F.E. (Part – I) (Old) (CBCS) Examination Nov/Dec-2019
APPLIED MECHANICS

Day & Date: Monday, 09-12-2019
 Time: 10:00 AM To 01:00 PM

Max. Marks: 56

- Instructions:**
- 1) All questions are compulsory.
 - 2) Use of non programmable scientific calculator allowed.
 - 3) Figures to the right indicate full marks.
 - 4) Assume suitable data if necessary and state it clearly.

Section – I

Q.2 Attempt any four of the following questions.

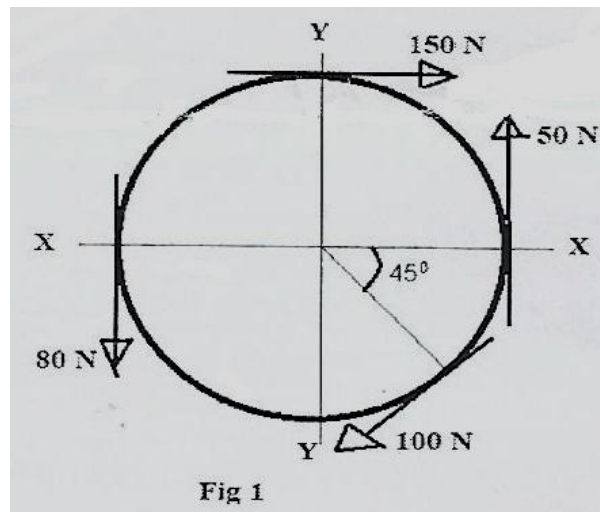
12

- a) State and prove the Varignon's theorem.
- b) State and prove the Lami's theorem
- c) Enlist different types of supports and explain any two with neat sketches.
- d) Explain the concept of free body diagram with neat sketch.
- e) What are the different types of trusses explain any two with neat sketches.
- f) State and prove parallel axis theorem.

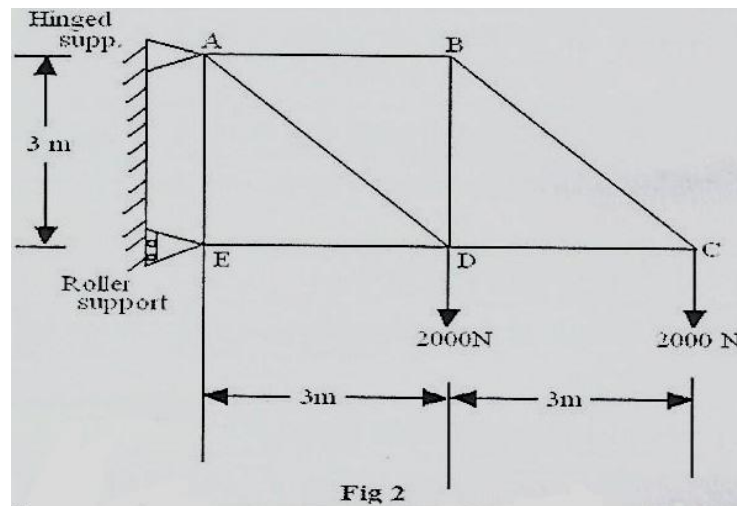
Q.3 Attempt any two of the following questions.

16

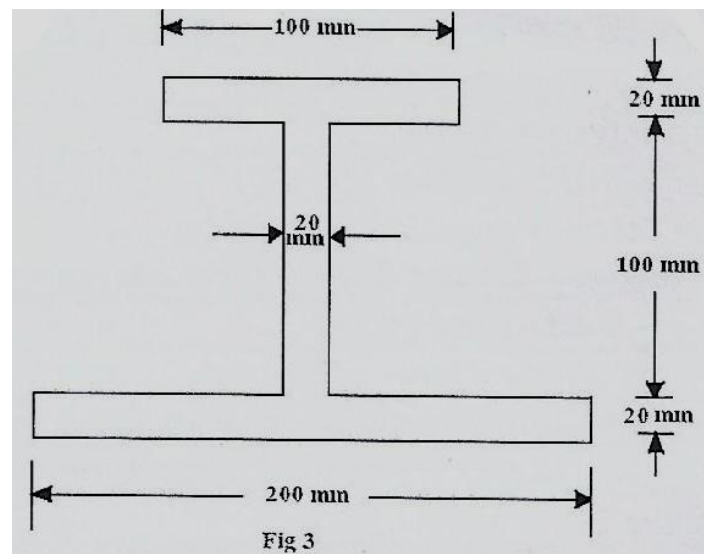
- a) Determine the resultant of the four forces acting tangentially to a circle of radius 3m as shown in fig 1 below. Also determine location of resultant from center of circle.



- b) Find out forces in all members CD, DE, BD and AD of a truss as shown in fig.2 below



- c) Find the moment of inertia of the section shown in fig. (3) About the centroidal axis XX perpendicular to the web.



Section-II

Q.4 Attempt any four of the following questions.

12

- Derive the three equations of linear motion for a body moving with constant acceleration 'a'
- What is mean by relative velocity? Explain it with example.
- State and explain D' Alembert's principle of linear motion.
- Derive the equation of trajectory of a projectile.
- State and derive principle of work energy for linear motion
- State and explain principle of conservation of energy.

Q.5 Attempt any two of the following questions.

- a) A stone is dropped into a well is heard to strike the water after 6 seconds. Find depth of well, if the velocity of sound is 350 m/sec.
- b) Two bodies of weight 60 N and 40 N are connected to the two ends of a light inextensible string. The string is passing over a smooth pulley. Determine:
- i) Acceleration of the system
 - ii) Tension in the string.
- Use D' Alembert's principle
- c) A car moving on a straight level road skidded for a total distance of 60 meters after the breaks were applied. Determine the speed of the car, just before the breaks were applied, if the co-efficient of friction between the car tyres and the road is 0.4. take $g = 9.81 \text{ m/sec}^2$



Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2018
APPLIED MECHANICS

Day and Date : Friday, 4-5-2018
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 70

- Instructions :** 1) Q. No. 1 is **compulsory**. It should be solved in **first 30 minutes** in Answer Book Page No. 3. **Each** question carries **one** mark.
- 2) **Answer MCQ/Objective type questions on Page No. 3 only. Don't forget to mention, Q.P. Set (P/Q/R/S) on Top of Page.**
- 3) Assume additional data, if required and state it **clearly**.
- 4) Figures to the **right** indicate **full** marks.

MCQ/Objective Type Questions

Duration : 30 Minutes

Marks : 14

1. Choose the correct alternatives (1 mark **each**) : **(14×1=14)**
- 1) The algebraic sum of the two forces forming a couple is always equal to
 - a) Magnitude of one of the forces
 - b) Zero
 - c) Negative number
 - d) Positive number
 - 2) If two forces F_1 and F_2 are acting on a particle and if $\theta = 180^\circ$, then the resultant of the two forces is given as
 - a) $F_1 + F_2$
 - b) $F_1 - F_2$
 - c) $F_1^2 + F_2^2$
 - d) None of these
 - 3) The ratio of static friction to dynamic friction is always
 - a) = 1
 - b) < 1
 - c) > 1
 - d) None of these
 - 4) In the method of sections for trusses, the section must be passed so as to cut not more than
 - a) two members
 - b) three members
 - c) four members
 - d) five members
 - 5) For a truss if 'n' is number of members and 'j' is number of joints then it is said to be deficient when
 - a) $n < (2j - 3)$
 - b) $n > (2j - 3)$
 - c) $n = (2j - 3)$
 - d) $j = 2n - 3$



- 6) The moment of inertia of a rectangle of base 'b' and height 'h' about its base is
 - a) $\frac{bh^3}{36}$
 - b) $\frac{bh^3}{24}$
 - c) $\frac{bh^3}{12}$
 - d) $\frac{bh^3}{3}$
- 7) Polar moment of inertia is given by
 - a) I_{xx}/I_{yy}
 - b) $I_{xx} - I_{yy}$
 - c) $I_{xx} + I_{yy}$
 - d) $I_{xx} \times I_{yy}$
- 8) A body is moving with a velocity of 2 m/sec. After 4 seconds the velocity of the body becomes 5 m/sec. The acceleration of the body is
 - a) 0.5 m/sec²
 - b) 0.75 m/sec²
 - c) 1 m/sec²
 - d) 1.5 m/sec²
- 9) The motion of a bicycle wheel is
 - a) Linear
 - b) Rotary
 - c) Translatory
 - d) Rotary as well as translatory
- 10) Time of flight of a projectile is given by
 - a) $\frac{u \sin \alpha}{g}$
 - b) $\frac{u^2 \sin \alpha}{g}$
 - c) $\frac{2u \sin \alpha}{g}$
 - d) $\frac{2u \sin^2 \alpha}{g}$
- 11) The acceleration of a block sliding down on inclined plane is
 - a) Same as acceleration due to gravity
 - b) Less than acceleration due to gravity
 - c) Greater than acceleration due to gravity
 - d) Uniformly increasing
- 12) If coefficient of restitution is one, then the two bodies are
 - a) Perfectly plastic
 - b) Partly elastic
 - c) Perfectly elastic
 - d) None of these
- 13) The following category of energy is associated with conservation force
 - a) Kinetic energy
 - b) Potential energy
 - c) Energy lost due to friction
 - d) None of these
- 14) A lift is moving upwards with an acceleration 'g'. The pressure exerted by man on the floor of the lift is
 - a) Equal to his weight
 - b) Zero
 - c) Double than his weight
 - d) None



Seat No.	
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F.E. (Part – I) (CBCS) Examination, 2018
APPLIED MECHANICS

Day and Date : Friday, 4-5-2018
Time : 10.00 a.m. to 1.00 p.m.

Marks : 56

- Instructions :** 1) **All** questions are **compulsory**.
2) Assume additional data, if required and state it **clearly**.
3) Figures to the **right** indicate **full** marks.

2. Solve **any four** out of six :

12

a) Calculate the forces in the members AB and AD of the truss shown in Fig. 1

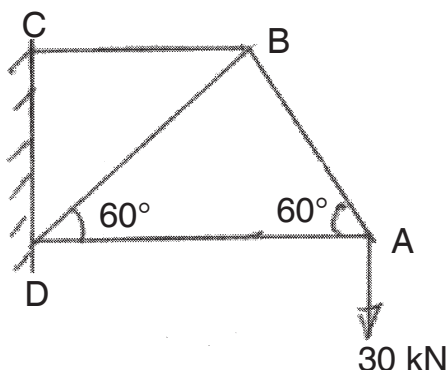


Fig. 1

- b) State and derive expression for parallel axis theorem.
c) State and explain Lami's theorem.
d) Find the magnitude and direction of the resultant for the two forces acting at point O as shown in Fig. 2.

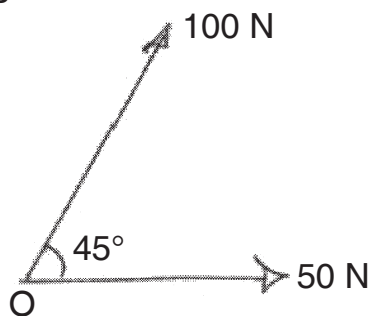


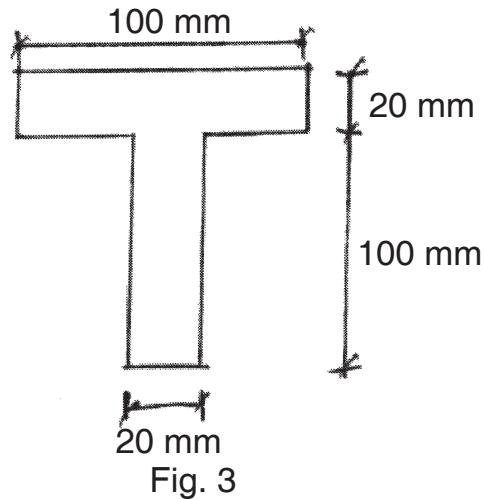
Fig. 2

e) Define and explain characteristics of couple.

Set P



- f) Locate the centroidal XX axis for the T section given below in Fig. 3



3. Solve **any two** out of three :

16

- a) Analyze the overhanging beam loaded as shown in Fig. 4 below

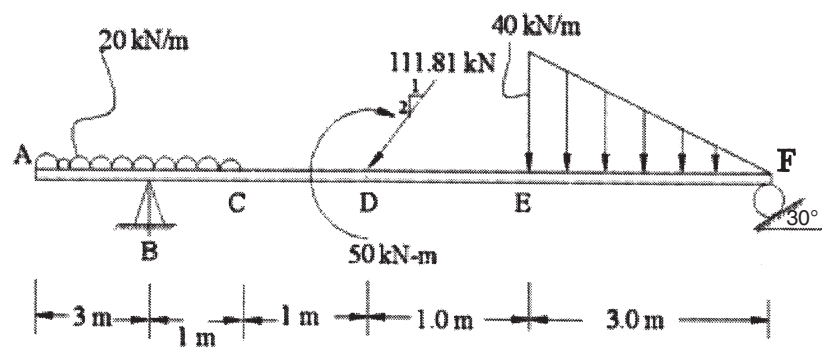


Fig. 4

- b) Determine the magnitude and nature of the forces in the members BC, GC and GF of the truss shown in Fig. 5

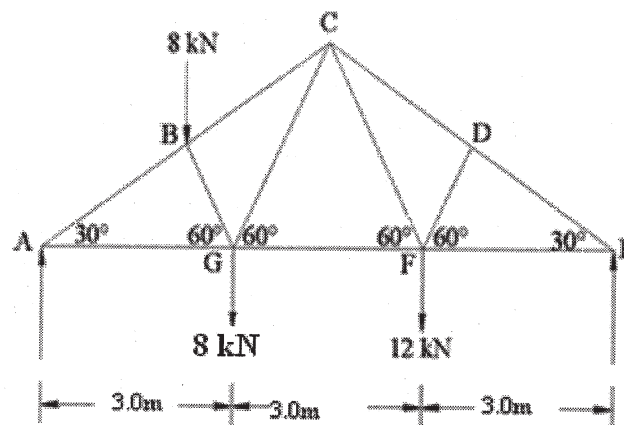


Fig. 5



- c) The cross section of a plain concrete culvert is as shown in Fig. 6. Determine the moment of inertia about the horizontal centroidal axis.

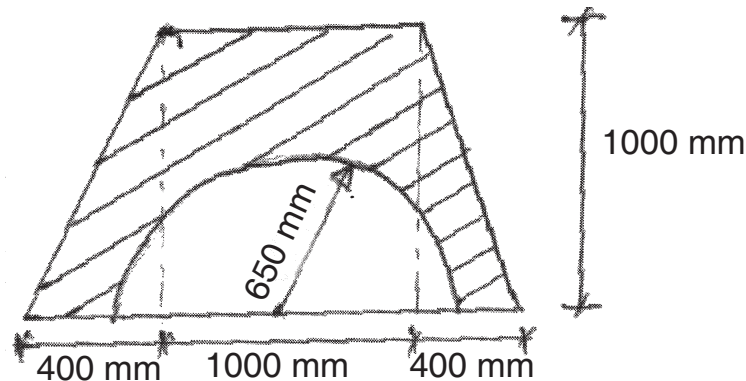


Fig. 6

4. Solve **any four** out of six :

12

- Derive equations of linear motion with uniform acceleration.
- A small steel ball is shot vertically upwards from the top of a building 20m above the ground with an initial velocity of 15 m/s. Find
 - In what time it will reach the maximum height.
 - How high above the building will the ball rise ?
- Explain the need for banking of roads and superelevation of rails.
- The rotation of a flywheel is governed by the equation $\omega = 3t^2 - 2t + 2$, where ω is in rad/sec and t is in sec. After 1 sec from the start, the angular displacement was 4 rad. Determine the angular displacement when $t = 3$ sec.
- Enlist the types of motion curves and explain any one with neat sketch.
- A ball 'A' of mass 0.25 kg moving on smooth horizontal table with velocity of 10 m/s strikes on identical stationary ball 'B' on the table. Find velocity of the ball 'B' just after the impact. The impact is perfectly plastic. Refer Fig. 7.

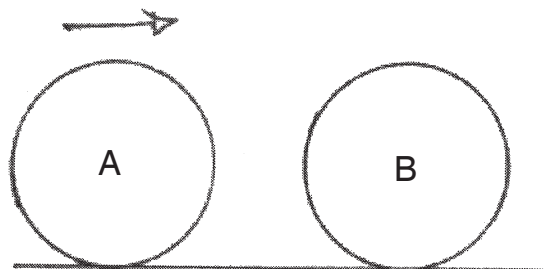


Fig. 7



5. Solve **any two** out of three :

16

- a) A bullet is fired upward at an angle of 30° with horizontal from point P on hill and hit the target which is 80 m lower than P. Initial velocity of bullet is 100 m/s. Calculate
- the maximum height up to which bullet will reach above horizontal
 - the velocity with which bullet strikes the ground
 - total time of flight required.
- b) In what distance will body 1 shown in Fig. 8 attain a velocity of a 3 m/s starting from rest ? Take coefficient of friction between blocks and plane as 0.2. Assume pulley is smooth. What is the tension in the chord ?

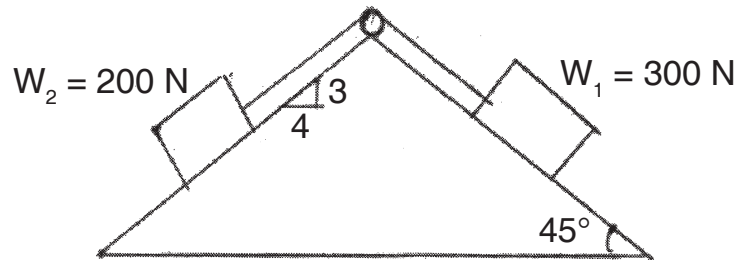


Fig. 8

- c) A body weighing 300 N is pushed up at 30° inclined plane while 400 N force acting parallel to the plane. If initial velocity of body is 1.5 m/s and coefficient of kinetic friction $\mu = 0.2$, what velocity will body have after moving 6 m ? Refer Fig. 9.

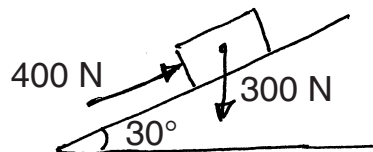


Fig. 9