Hall Ticket Number:

CE114 (R20)

B.TECH. DEGREE EXAMINATION, DECEMBER-2024

Semester I [First Year] (Supplementary)

ENGINEERING MECHANICS

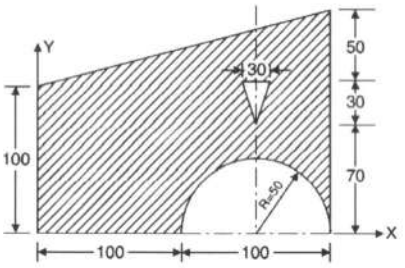
Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) State the principle of transmissibility. CO1
   (b) Distinguish between centroid and centre of gravity. CO1
   (c) What is the centroid of a triangle with respect to base? CO1
   (d) List the assumptions made in the analysis of a simple truss. CO2
   (e) State different types of friction. CO2
   (f) What is the coefficient of friction when heavy truck is at rest? CO2
   (g) Define couple. CO1
   (h) Define unit vector. CO3
   (i) State principle of virtual work. CO3
   (j) What is a redundant truss? CO2
   (k) Define moment of inertia of an area. CO4
   (l) State parallel axis theorem. CO4
   (m) Define rigid body. CO1
   (n) What is the relation between number of members and joints in perfect truss? CO2

UNIT – I

2. (a) State and prove Varignon's theorem. (6M) CO1
   (b) With respect to the coordinate axes x and y locate the centroid of the shaded area shown in figure. (8M) CO1



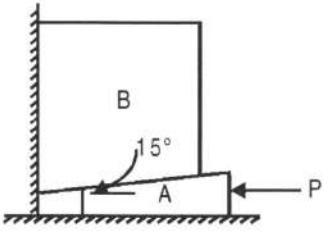
(OR)

3. (a) Explain with examples any five system of forces. (6M) CO1

   (b) Resultant of two forces, one of which is double the other is 260 N. If the direction of the larger force is reversed and the other remains unaltered, the resultant reduces to 180 N. Determine the magnitude of the forces and the angle between the forces. (8M) CO1

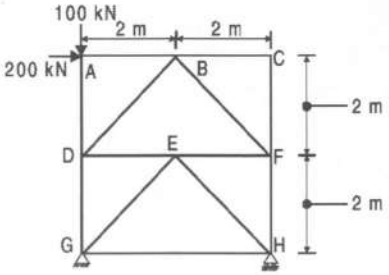
UNIT – II

4. Find the horizontal force P required to push the block A of weight 150 N which carries block B of weight 1280 N as shown in figure. Take angle of limiting friction between floor and block A as 14° and that between vertical wall and block B as 13° and coefficient of limiting friction between the blocks as 0.3 CO2



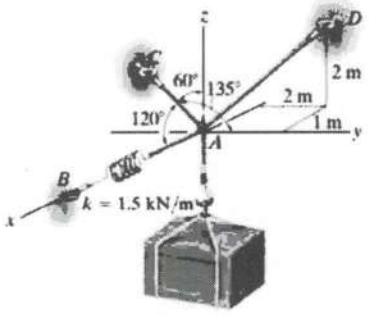
(OR)

5. Find the forces in all the members of truss shown in figure. CO2



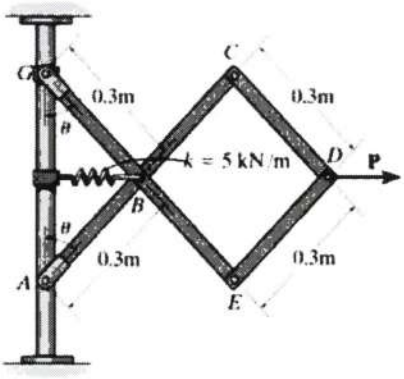
UNIT – III

6. Determine the tensions in each cord used to support the 100 kg crate shown in figure. CO3



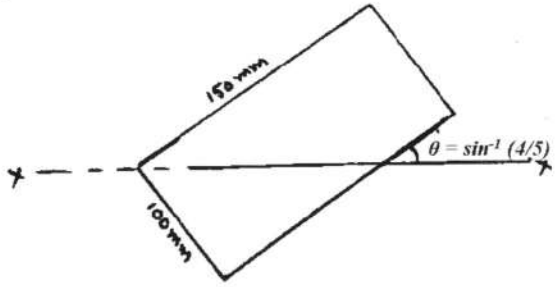
(OR)

7. Determine the required force P, needed to maintain the equilibrium of scissors linkage (shown in figure) when $\theta = 60°$ by the principle virtual work. The spring is unstretched when $\theta = 30°$. Neglect the mass of the links. CO3



UNIT – IV

8. Determine the moment of inertia of the rectangle shown in figure about x-x axis. CO4



(OR)

9. Derive the mass moment of inertia of a sphere of uniform density and radius 'R' about its diametrical axis. CO4

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CE114 (R20)

Hall Ticket Number:

CE114 (R20)

B.TECH. DEGREE EXAMINATION, APRIL-2024

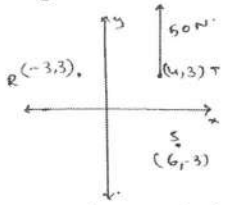
Semester I [First Year] (Supplementary)

ENGINEERING MECHANICS

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

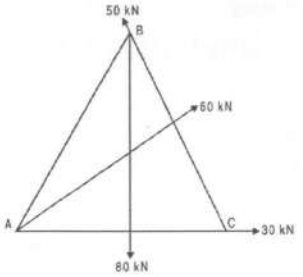
1. Answer the following:
   (a) State Lami's theorem with neat sketch. CO1
   (b) Compute the center of gravity of a semi-circular plate having diameter 66 mm from its base. CO1
   (c) State the varignons theorem of moments. CO1
   (d) Determine moment about point T in the figure below for the forces given CO1



   (e) State the assumptions made in the analysis of plane truss. CO2
   (f) Mention types of friction. CO2
   (g) Evaluate the dot product given in the following expression: {(i.i) + (-i.j) + (-k.k) + (k.i)}.(Ai +Bj + Cz) CO3
   (h) State principle of virtual work. CO3
   (i) What are the static equilibrium elements of concurrent force system in space? CO3
   (j) State perpendicular axis theorem with a neat sketch and specify the necessary equation. CO4
   (k) Write the unit of Area moment of inertia. CO4
   (l) Define mass moment of inertia. CO4
   (m) Define cone of friction. CO2
   (n) What is a rigid body? CO1

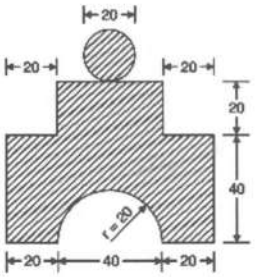
UNIT – I

2. An equilateral triangular plate of side 200 mm is acted by system of forces shown in figure. Compute the resultant force and specify the location of resultant force with respect to point A. CO1



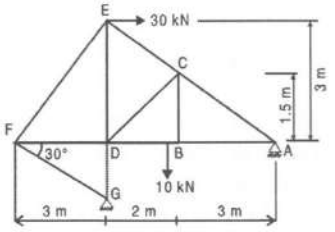
(OR)

3. Determine coordinates of centroid of the figure with respect to a specified coordinate axes. CO1



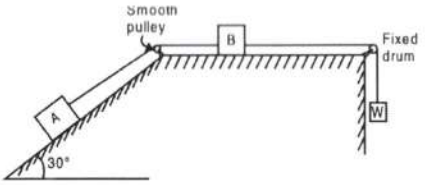
UNIT – II

4. Determine the member forces for the truss shown in figure. Truss is hinged at G and supported on Roller at A. CO2



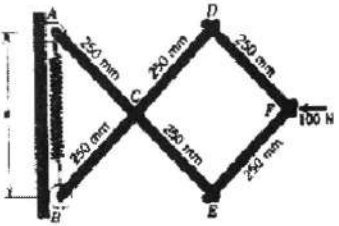
(OR)

5. Compute the minimum and maximum value of W required to move block A and block B respectively. Consider Weight of block A = 3000 N, Weight of block B = 3000 N. Coefficient of friction at all surfaces of contact is 0.2. Assume pulley as smooth. CO2



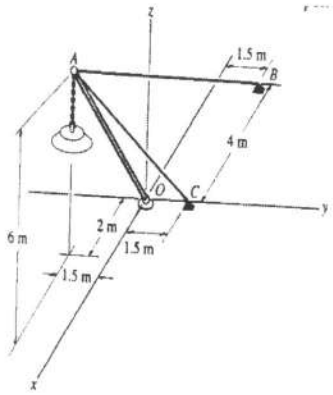
UNIT – III

6. The parallelogram frame is loaded by a horizontal 100 N force. The unstretched length of the spring is 350 mm. Determine the required stiffness k of the spring if s = 400 mm in the static equilibrium position in figure. CO3



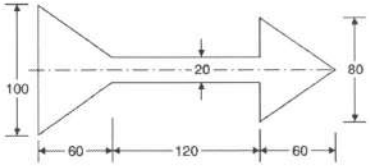
(OR)

7. The lamp is supported by pole AO and cables AB and AC in the position shown in figure. The cables AB and AC can sustain a maximum tension of 500 kN and the pole can support a maximum compression of 300 kN. Determine maximum weight of the lamp that can be supported in the position shown. Assume the force in the pole acts along the axis of the pole CO3



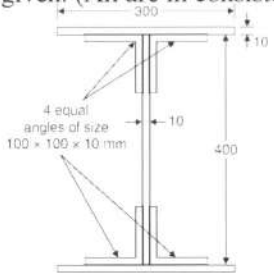
UNIT – IV

8. Determine Moment of inertia of the figure, about its centroidal X-X and Y-Y axes (all measurements shown are in consistent units) CO4



(OR)

9. Compute Moment of inertia about centroidal axes for the composite figure given. (All are in consistent units). CO4



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F-2

Hall Ticket Number:

CE114 (R20)

B.TECH. DEGREE EXAMINATION, JANUARY-2024

Semester I [First Year] (Regular & Supplementary)

ENGINEERING MECHANICS

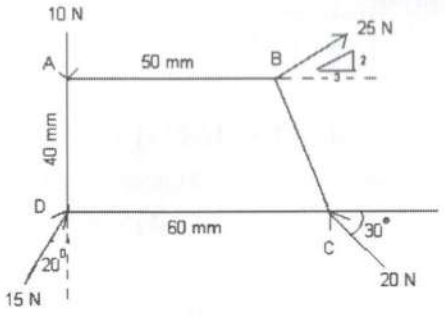
Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Define a force. CO1
   (b) State law of transmissibility of forces. CO1
   (c) Define free body diagram. CO1
   (d) What is a deficient truss? CO2
   (e) What is the coefficient of friction when a heavy truck is at rest? CO2
   (f) Give the example of types of loads and beams in your class room. CO2
   (g) Define angle of repose. CO2
   (h) Differentiate moment and couple. CO1
   (i) Can you divide a vector by another vector? CO3
   (j) What is meant by position vector? CO3
   (k) What is the moment of inertia of a semicircle plate with respect to its base? CO4
   (l) Differentiate between virtual work and real work. CO3
   (m) What is the limitation of parallel axis theorem? CO4
   (n) State the relation between moment of inertia and radius of gyration. CO4

UNIT – I

2. Replace the given system of forces acting on a body as shown in the figure by a single force and couple acting at the point A. CO1

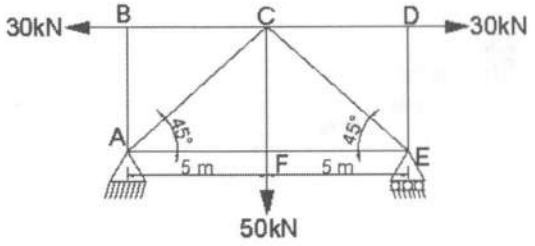


(OR)

3. (a) State and prove Varignon's theorem. (7M) CO1
   (b) State and prove parallelogram law of forces. (7M) CO1

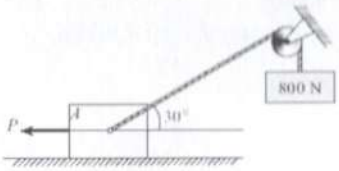
UNIT – II

4. Determine the forces in the members of the truss by method of sections. CO2



(OR)

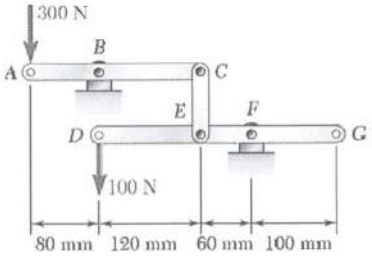
5. (a) The block A shown in figure, weighs 2000 N. The cord attached to A passes over a frictionless pulley and supports a weight equal to 800 N. The value of coefficient friction between A and the horizontal plane is 0.35. Determine the horizontal force P (i) If the motion is impending towards the left (ii) if the motion is impending towards the right. (8M) CO2



(b) What are the advantages and disadvantages of friction in the real life? (6M) CO2

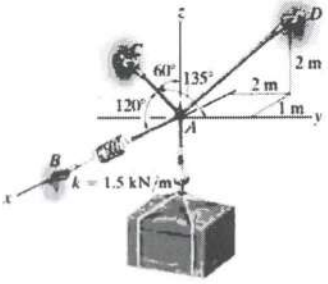
UNIT – III

6. Determine the couple M which must be applied to member DEFG to maintain the equilibrium of the linkage by virtual work method. CO3



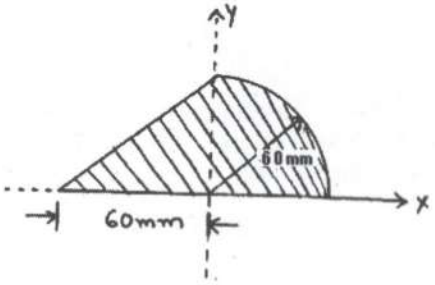
(OR)

7. Determine the tensions in each cord used to support the 100 kg crate shown in figure. CO3



UNIT – IV

8. Find the moment of inertia of the shaded area, as shown in figure about its centroidal axes parallel to x-axis. CO4



(OR)

9. Determine the mass moment of inertia of rectangular plate of width 'b', height 'h' and thickness 't' about its centroidal axes. CO4

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CE114 (R20)

File-2

Hall Ticket Number:

CE114 (R20)

B.TECH. DEGREE EXAMINATION, JUNE-2023

Semester I [First Year] (Supplementary)

ENGINEERING MECHANICS

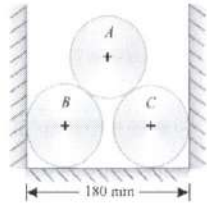
Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

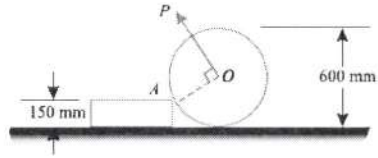
1. Answer the following:
   (a) Give the equations of static equilibrium conditions. CO1
   (b) What are the characteristics of a force? CO1
   (c) Differentiate between moment and couple. CO1
   (d) List the types of parallel forces. CO2
   (e) List the types friction. CO2
   (f) Distinguish between centroid and center of gravity. CO2
   (g) State parallel axis theorem. CO2
   (h) Give the moment of inertia for a sphere of radius 'R' about its geometrical axis. CO3
   (i) What is mass moment of inertia? CO3
   (j) Differentiate between truss and a frame. CO3
   (k) In which situations method of sections is preferred rather than method of joints? CO4
   (l) What is angle of friction? CO4
   (m) What is unit vector? CO4
   (n) List the assumptions made in the analysis of pin-jointed frame. CO3

UNIT – I

2. (a) Three cylinders weighing 100 N each and of 80 mm diameter are placed in a channel of 180 mm width as shown in figure. Determine the pressure exerted by (i) the cylinder A on B at the point of contact (ii) the cylinder B on the base and (iii) the cylinder B on the wall. (7M) CO1

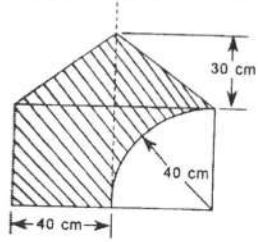


(b) A uniform wheel of 600 mm diameter, weighing 5 kN rests against a rigid rectangular block of 150 mm height as shown in figure. Find the least pull, through the centre of the wheel, required just to turn the wheel over the corner A of the block. Also find the reaction on the block. Take all the surfaces to be smooth. (7M) CO1



(OR)

3. (a) Find the centroid of the shaded area shown in figure. (7M) CO1

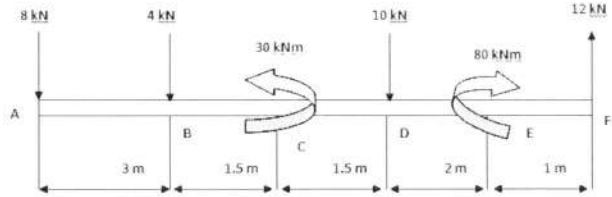


(b) Figure shows a parallel force system of four forces and two couples: (7M) CO1

(i) Replace it by single force and obtain its location from point A

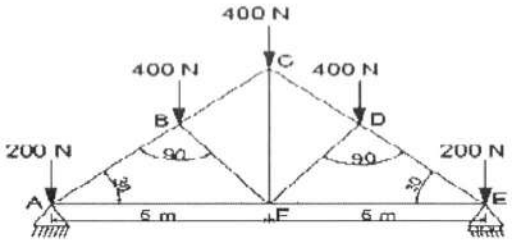
(ii) Replace it by force couple system at point A

(iii) Replace it by a force couple system at point D.



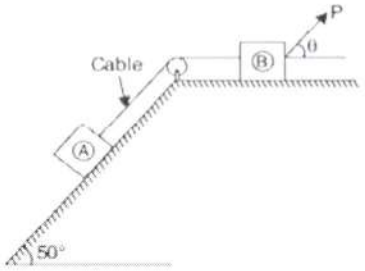
UNIT – II

4. Calculate the forces induced in the members of the pin-jointed truss shown in figure. CO2



(OR)

5. A system consists of two blocks connected by a cable is as shown in figure. The masses of the block A and B are 7.5 kg and 25 kg respectively. Determine the magnitude of minimum force and its inclination with reference to horizontal, to be applied on block B. The block having impending motion towards the right.Take coefficient of friction at all contact surfaces to be 0.28. CO2



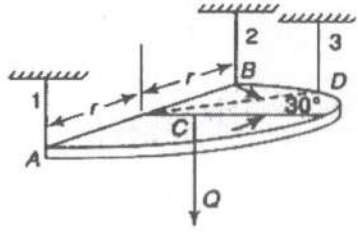
UNIT – III

6. (a) A force F = 2i + 4j – 3k is applied at a point P (1, 1, –2). Find the moment of the force F about the point (2, –1, 2). (7M) CO3

   (b) The lines of action of three forces concurrent at origin O pass respectively through points A,B,C having coordinates (–1, 2, 4), (3, 0, –3) and (2, –2, 4). The magnitude of the forces are F_a = 200 N, F_b = 45 N and F_c = 150 N. Find magnitude and direction of their resultant (7M) CO3

(OR)

7. (a) A homogeneous semicircular plate of weight 'Q' and radius 'r' is supported in a horizontal plane by three vertical strings as shown in figure. Determine the tensile forces S_1, S_2 and S_3 in these strings. (7M) CO3



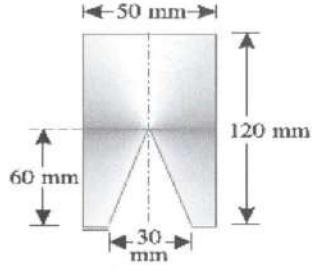
(b) Determine the resultant of a system of concurrent forces having the following magnitude and passing through the origin and indicated points p = 14000 N (12, 6 –4), T = 2600 N (–3, –4, 12), F = 1350 N (6, –3, –6). (7M) CO3

UNIT – IV

8. Determine the mass moment of inertia of a sphere of radius R about centroidal axes. CO4

(OR)

9. Find the moment of inertia of the shaded area as shown in figure about centroidal axes. CO4



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file-2

Hall Ticket Number:

CE114 (R20)

B.TECH. DEGREE EXAMINATION, MARCH-2023

Semester I [First Year] (Regular & Supplementary)

ENGINEERING MECHANICS

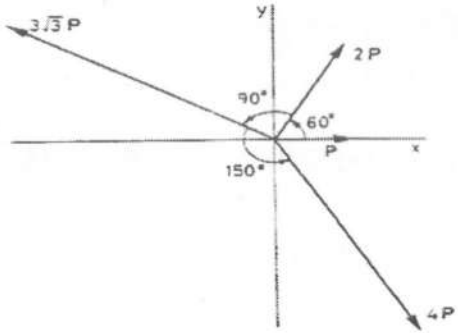
Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) State Lami's theorem. CO1
   (b) Define couple. CO1
   (c) Mention the types of friction. CO2
   (d) What is the centroid of a semi-circle? CO1
   (e) Define polar moment of inertia. CO4
   (f) Define radius of gyration. CO4
   (g) Define angle of friction. CO2
   (h) Mention the types of supports. CO1
   (i) Mention the types of system of forces. CO1
   (j) Define moment of a force about a point in force system in space. CO3
   (k) State principle of virtual work. CO3
   (l) Define mass moment of inertia. CO4
   (m) What is the mass moment inertia of circular plate of radius R and thickness t about its centroidal axis. CO4
   (n) Define cone of friction. CO2

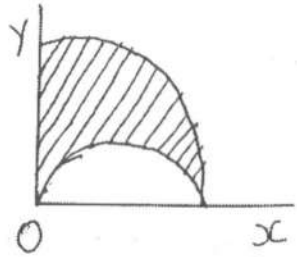
UNIT – I

2. Find the magnitude and direction of the resultant R of four concurrent forces acting as shown in figure. CO1



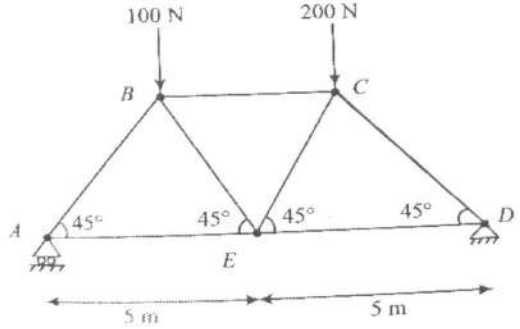
(OR)

3. Locate the centroid of the shaded area obtained by removing a semicircle of diameter 'R' from a quadrant of a circle of radius 'R' shown in figure. CO1



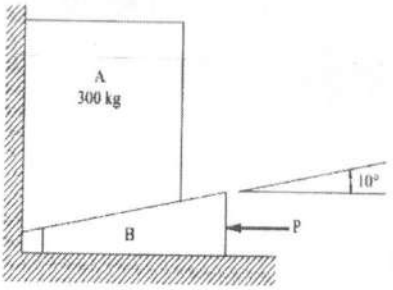
UNIT – II

4. Find the forces in all the members of the truss shown in figure by using method of joints. CO2



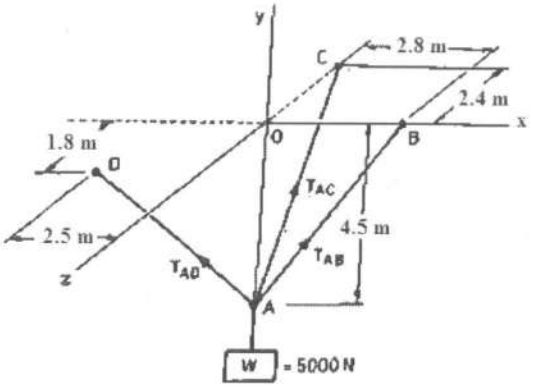
(OR)

5. If the coefficient of static friction equals 0.3 for all surfaces of contact, determine the smallest value of force P necessary to raise the block A. Neglect the weight of the wedge B. CO2



UNIT – III

6. A load W of magnitude 5000 N is supported by three cables. Determine the tension in cables. CO3

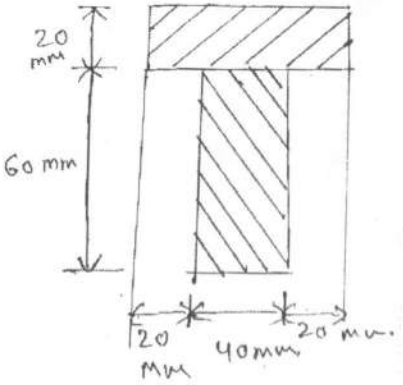


(OR)

7. Explain about principle of virtual work and application of the principle of virtual work. CO3

UNIT – IV

8. Determine the moment of inertia of the area of T-section as shown in figure with respect to the centroidal axes. CO4



(OR)

9. Find the mass moment of inertia of the solid cone of height 'h' and base radius 'R' about its axis of rotation. CO4

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CE114 (R20)

Hall Ticket Number:

file-2

CE114(R20)

B.TECH. DEGREE EXAMINATION, MARCH-2022

Semester I [First Year] (Supplementary)

ENGINEERING MECHANICS

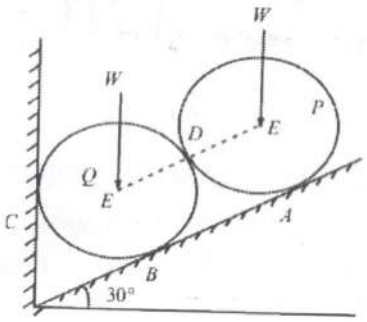
Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) Mention the principle of statics. CO1
   (b) Calculate the magnitude of resultant, when two forces of magnitude 56 N and 67 N act an angle of 38^{o} degrees to each other. CO1
   (c) Distinguish between centroid and centre of gravity. CO1
   (d) Distinguish couple and torque. CO2
   (e) Enlist the types of friction. CO2
   (f) Distinguish method of sections and method of joints. CO2
   (g) Define moment of a force. CO2
   (h) Define unit vector. CO3
   (i) Give a clear representation the moment using vector notation CO3
   (j) Define dot product of vector. CO3
   (k) Define polar moment of inertia and state its equation. CO4
   (l) Calculate the radius of gyration of a circular plate of diameter 120 mm. CO4
   (m) State parallel axis theorem. CO4
   (n) What is the unit of mass moment of inertia? CO4

UNIT – I

2. Two cylindrical identical rollers A and B, each of weight W = 500 N are supported by an inclined plane and vertical wall and makes an angle of 30^{0} with the horizontal as shown in figure. Assuming all surfaces to be smooth, determine the reactions at A, B and C. CO1

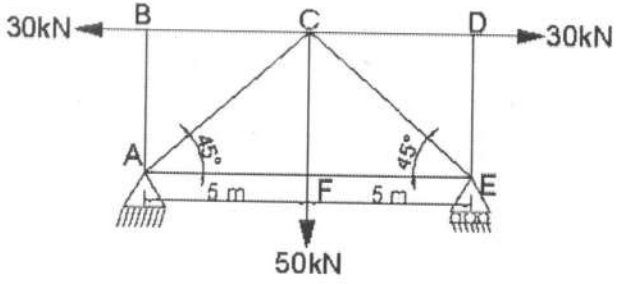


(OR)

3. (a) Define the following with examples: (7M) CO1
   (i) Coplanar and Non-coplanar forces
   (ii) Collinear and Non-collinear forces
   (b) Two forces of magnitude (P+Q) and (P–Q) acting at a point include an angle 2θ. Show that, if their resultant makes an angle α with the bisector of the angle between them, then P tan α = Q tan θ. (7M) CO1

UNIT – II

4. Using method of joints, determine the forces in all the members of a truss shown in figure.

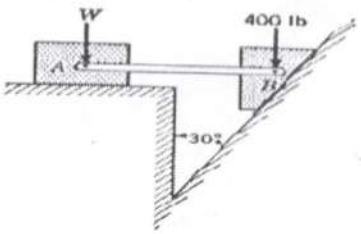


CO2

(OR)

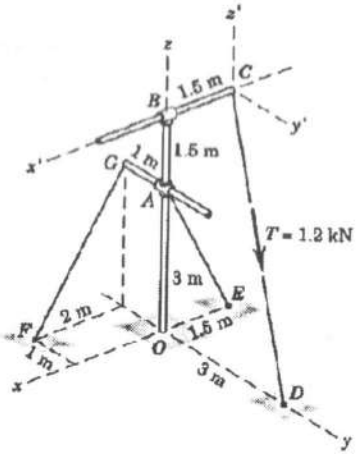
5. Two blocks, connected by a horizontal link AB are supported on two rough planes as shown in figure. The coefficient for friction of block A on the horizontal plane is

$\mu = 0.4$. The angle of friction for block B on the inclined plane is $\mu = 0.15$. What is the smallest weight W of block A for which equilibrium of the system can exist? CO2



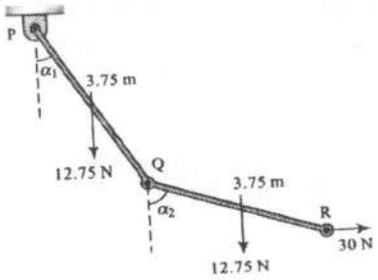
UNIT – III

6. The rigid pole and cross-arm assembly of figure. Determine the vector expression for the moment of the 1.2 kN tension (i) About point O (ii) About the pole z-axis. Find each moment in two different ways. CO3



(OR)

7. Two uniform bars from a link are shown in figure. Bars are of 3.75 m in length and 12.75 N weight. The system is pulled with a force of 30 N. Using method of virtual work, determine the angles α_1 and α_2 with the verticals. CO3

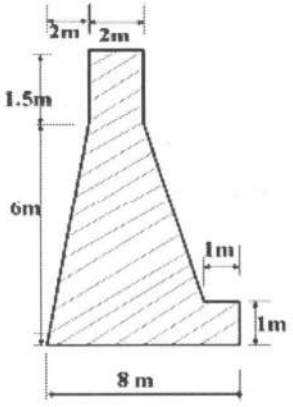


UNIT – IV

8. Determine the mass moment of inertia of right circular cone of mass M, base radius R and height H. CO4

(OR)

9. Determine moment of interia of shaded area as shown in given figure with respect to its base. CO4



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CE114(R20)

Hall Ticket Number:

file-2

CE114(R20)

B.TECH. DEGREE EXAMINATION, OCTOBER-2021

Semester I [First Year] (Supplementary)

ENGINEERING MECHANICS

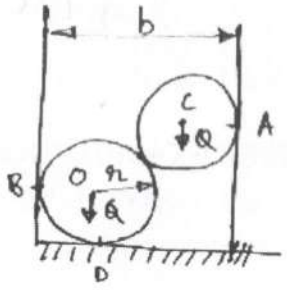
Time: Three hours Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

1. Answer the following:
   (a) State Parallelogram Law of Forces. CO1
   (b) State Law of Superposition of force. CO1
   (c) Define Moment of a Force. CO1
   (d) What is radius of gyration? CO4
   (e) Define Mass Moment of Inertia. CO4
   (f) State parallel axis theorem. CO4
   (g) What is meant by Perfect Truss? CO2
   (h) Define Kinetic friction. CO2
   (i) Define virtual displacement. CO3
   (j) Define Moment of a force in vector notation for spatial force system. CO3
   (k) Define position vector. CO3
   (l) Write the equations of equilibrium for a concurrent force system in a plane. CO1
   (m) Write the expression for mass moment of Inertia of cone of base radius R and mass M about its axis of rotation. CO4
   (n) Define (i) coefficient of friction (ii) angle of friction. CO2

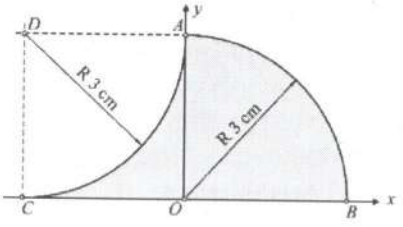
UNIT – I

2. Two smooth spheres, each of radius r and weight Q rest in a horizontal channel having vertical walls, the distance between which is b. Find the pressures exerted on the walls and floor at the points of contact A, B and D. The following numerical data are given: r = 250 mm, b = 900 mm and Q = 450 N. CO1



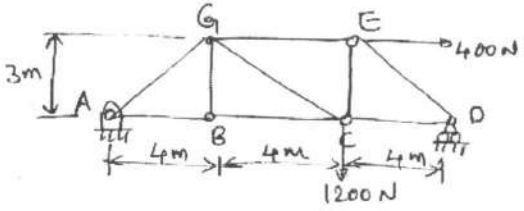
(OR)

3. Find the centroid of the shaded area as shown in figure. CO1



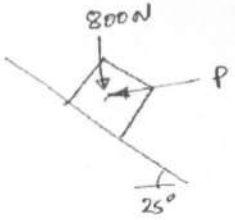
UNIT – II

4. For the truss loaded as shown in figure. Find the force in members GE, GC and BC by method of sections only. CO2



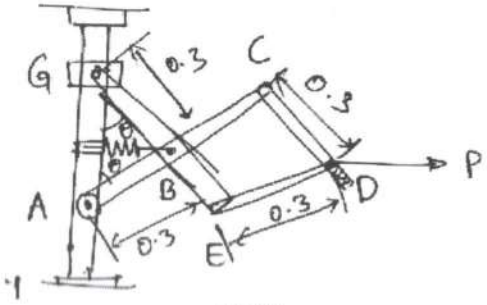
(OR)

5. A support block is acted upon by two forces as shown in figure. Knowing that $\mu_s = 0.35$, $\mu_k = 0.25$. Determine force P required (i) to start block moving up the plane (ii) to keep it moving up (iii) prevent it from sliding down. CO2



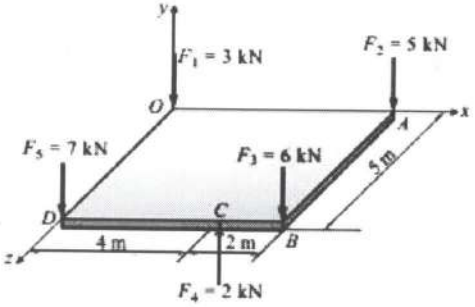
UNIT – III

6. Determine the required force P, needed to maintain equilibrium of scissors linkage when $\theta = 30^{\circ}$, mass of links are neglected. Use principle of virtual work. CO3



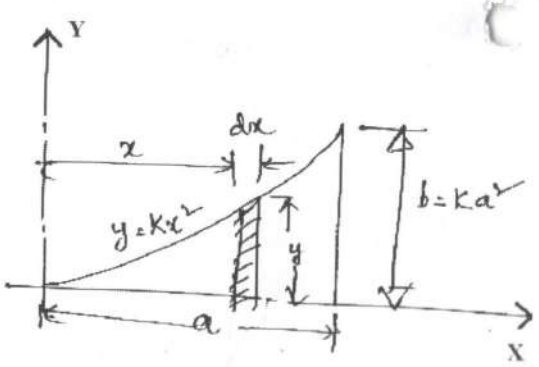
(OR)

7. Five vertical forces are acting on a horizontal plate. Find resultant of the forces and point of application w.r.t. origin. CO3



UNIT – IV

8. Calculate the moment of inertia given area of the area shown figure w.r.t x and y axes. CO4



(OR)

9. Determine the mass moment of inertia of the cylinder of length L and radius R about its vertical axis. Assume the density of the material is constant. CO4

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CE114(R20)

Hall Ticket Number:

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CE114(R20)

B.TECH. DEGREE EXAMINATION, JULY-2021

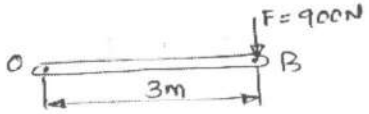
Semester I [First Year] (Regular)

ENGINEERING MECHANICS

Time: Three hours | Maximum Marks: 70

Answer Question No.1 compulsorily. (14 x 1 = 14)
Answer One Question from each unit. (4 x 14 = 56)

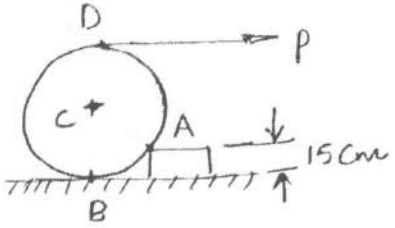
1. Answer the following:
   (a) Define Law of Parallelogram of forces. CO1
   (b) Explain Composition of forces with a simple diagram. CO1
   (c) Define Moment of a force. CO1
   (d) Define unit vector. CO3
   (e) Resolve the force F = 900 N acting at B into a couple and a force at O. CO1



   (f) Mention Degrees of Freedom in various supports used in beams. CO1
   (g) What is the centroid for semicircular area? CO1
   (h) What is meant by virtual work? CO3
   (i) Write down the relation between No. of members (m), No. of joints (j) and number of support reaction components (r) in a perfect truss. CO2
   (j) What is a perfect truss? CO2
   (k) What is imperfect redundant truss? CO2
   (l) Define polar moment of inertia of a plane area. CO4
   (m) State parallel axis theorem for mass moment of Inertia. CO4
   (n) What is the relation between coefficient of friction and angle of friction? CO2

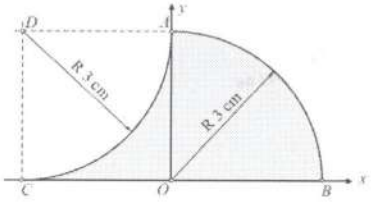
UNIT – I

2. A uniform wheel of 60 cm diameter and weighing 1000 N rest against a rectangular block 15 cm high lying on a horizontal force P applied to the end of the string wound around the circumference of the wheel. Find force P as shown in figure when the wheel is just about to roll over the block. CO1



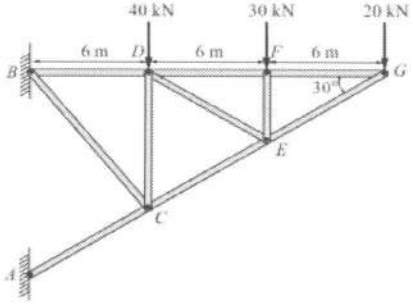
(OR)

3. Find the centroid of the shaded area as shown in figure. CO1



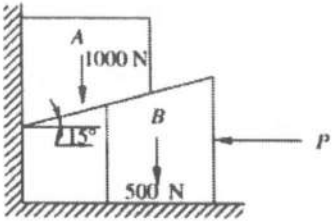
UNIT – II

4. For the truss loaded as shown in figure. Find the force in members DF, DE, CE and EF by method of joints only. CO2



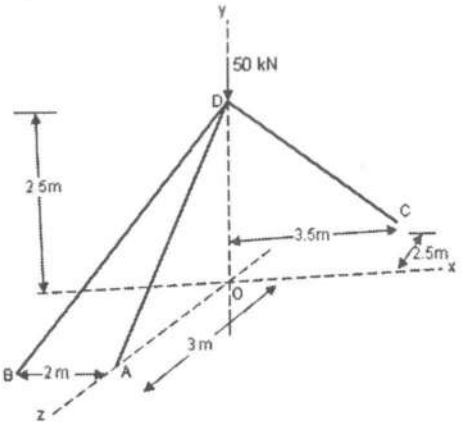
(OR)

5. A block A weighing 1000 N is to be raised by means of a 15° wedge B weighing 500 N. Assuming coefficient of friction between all contact surfaces to be 0.2, determine what minimum horizontal force P should be applied to raise the block shown in figure. CO2



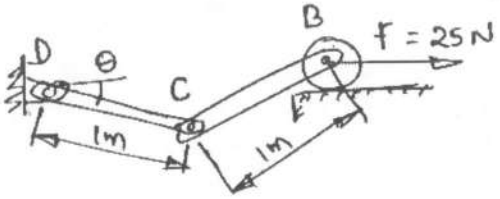
UNIT – III

6. A Tripod carrying a load of 50 kN has its supports A, B and C which are coplanar in x-z lane as shown in figure. Assuming all points to be of ball and socket type, find the forces in the members AD, BD and CD. CO3



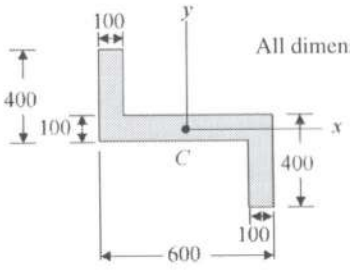
(OR)

7. Determine the angle θ for equilibrium of two-member linkage as shown in figure. Each member has a mass of 10 kg. Use principle of virtual work. CO3



UNIT – IV

8. Determine the moment of inertia of the section shown in figure about the x and y centroidal axis. CO4



(OR)

9. Determine the mass moment of inertia of the cylinder of length L about its vertical axis. The density of the material is constant. CO4

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