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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
First / Second Semester, B.E. - Semester End Examination; Sep. / Oct. - 2023
Engineering Mechanics
(Common to All Branches)

Time: 3 hrs   *Max. Marks: 100*

Course Outcomes

The Students will be able to:
CO1: Apply the knowledge of basic science and mathematics to classify the force systems and Compute its resultant.
CO2: Analyse the system of forces in equilibrium with or without frictional forces.
CO3: Locate the centroid and composite moment of inertia of irregular and built up sections.
CO4: Analyse the problems with respect to linear motion, curvilinear motion and energy.

<u>*Note:*</u> *I) PART - A is compulsory. **Two** marks for each question.*
  *II) PART - B: Answer any <u>**Two**</u> sub questions (from a, b, c) for a Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
1 a.	With an example, explain principle of transmissibility of forces.	2	L2	CO1	PO1
b.	Define Angle of friction and Angle of repose.	2	L3	CO2	PO1
c.	Define Centroid.	2	L2	CO3	PO1
d.	With a neat figure, state perpendicular axis theorem.	2	L2	CO3	PO1
e.	State the benefits of providing super elevation.	2	L1	CO4	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
2 a.	Define moment of a force and force. List the classification of force system with neat figure.	9	L2	CO2	PO1
b.	Three forces acting on book as shown in Fig. 1(b). Determine the direction of fourth force of magnitude 100 N, such that the hook is pulled in *x* – direction. Determine the Resultant and force in *x* – direction.	9	L3	CO2	PO1

Fig-1(b)

c.	Two identical Rollers each of weight 200 N are placed in a trough. Assuming all contact surfaces are smooth, find the reactions developed at contact surfaces *A*, *B*, *C* and *D* as shown in Fg. 1(c)	9	L3	CO2	PO1

Fig.1(c).

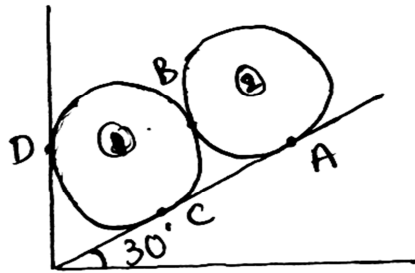**UNIT - II**   18

3 a. With a neat sketch, explain different types of loads.   9   L2 CO2 PO1

  b. Determine the smallest force 'P' required to just move the bottom block
      if; i) Top block is restrained by cable *AB*
        ii) Cable *AB* is removed, refer Fig. 2(b)
        Take μ_s = 0.40 and μ_k = 0.25

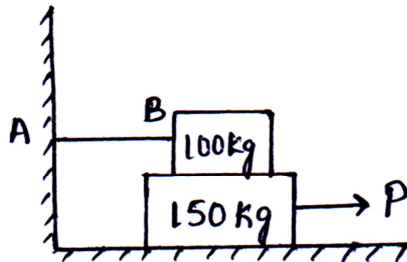   9   L3 CO2 PO1

Fig-2(b).

  c. Beam AB shown in Fig. 2(c). Determine the Reaction developed at the
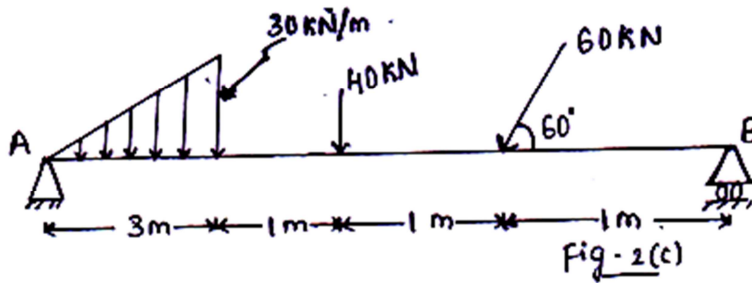   support when the forces shown in Fig. 2(c) are acting.

                                                                9   L3 CO2 PO1

Fig-2(c)

UNIT - III   18

4 a. Derive an expression for centroid of a triangle from first principle with
      respect to x – axis.   9   L3 CO3 PO2

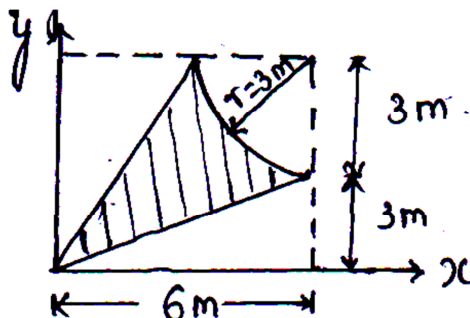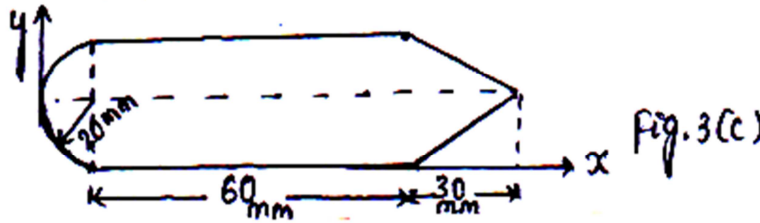 b. Locate the centroid of the shaded area as shown in Fig. 3(b)

                                                                9   L3 CO3 PO3

Fig.3(b)

c. Locate the centroid of area as shown in Fig. 3(c)

Fig. 3(c)

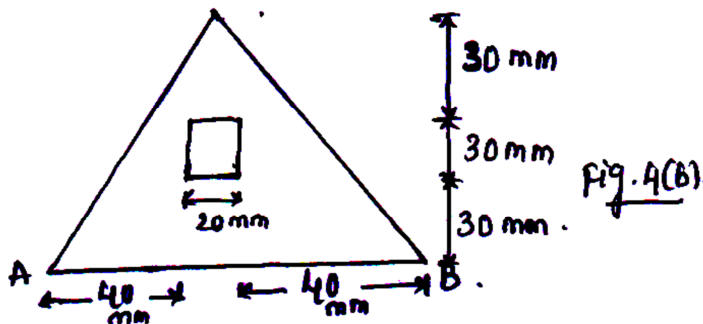|			
9	L3	CO3	PO3

UNIT - IV　　　　**18**

5 a. State and prove parallel axis theorem.　　9　L2　CO3　PO3

b. Determine the moment of inertia and radius of Gyration of the area shown in Fig. 4(b) about base AB and centroidal axis parallel to AB.

Fig. 4(b).

9　L3　CO3　PO3

c. Determine the second moment of area of a Rectangle about horizontal centroidal axis.　　9　L3　CO3　PO2

UNIT - V　　　　**18**

6 a. A Burglar' car starts with an acceleration of 2 m/s². A police van came after 10 seconds and continued to chase the Burglar's car with a uniform velocity of 40 m/s. Find the time taken by the police van to overtake the Burglar's car.　　9　L3　CO4　PO3

b. A stone is dropped into a well and a sound of splash is heard after 4 seconds. Find the depth of well, if the velocity of sound is 350 m/s.　　9　L1　CO4　PO3

c. A projectile is fired at certain angle with the horizontal range of 3.5 km. If the maximum height reached is 500 m, what is the angle of elevation of the cannon? What was the Muzzle velocity of the projectile?　　9　L3　CO4　PO3

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