| Exam.	New Back (2066 & Later Batch)		
Level	BE	Full Marks	80
Programme	BEL, BEX, BCT, BIE,B.Agri,B.Arch	Pass Marks	32
Year / Part	I / I	Time	3 hrs.

Subject: - Applied Mechanics *(CE401)*

✓ Candidates are required to give their answers in their own words as far as practicable.
✓ *Attempt __All__ questions.*
✓ *The figures in the margin indicate __Full Marks__.*
✓ *Assume suitable data if necessary.*

1. Why it is necessary to assume a solid body as a perfectly rigid in the Engineering study. [3]

2. What is free body diagram? The cylinder A and B rest in an inclined surface which makes an angle of 25° with horizontal as shown in figure below. Determine reaction at contact points. Take: [2+6]
   Weight of cylinder A (W_A) = 100 N
   Weight of cylinder B (W_B) = 200 N
   Diameter of cylinder A (r_A) = 60 mm
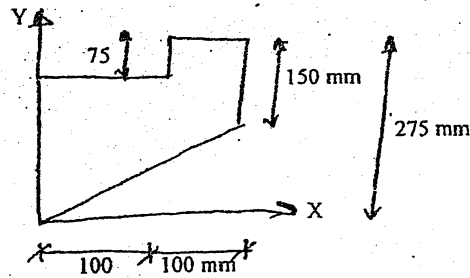   Diameter of cylinder B (r_B) = 9
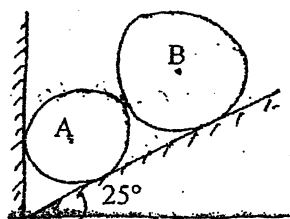
3. Find the resultant of force couple system at point 'A' as shown in figure below. Take F_1 = 100 KN, F_2 = 300 KN. Define a couple and show that couple is a free vector. [8+3]
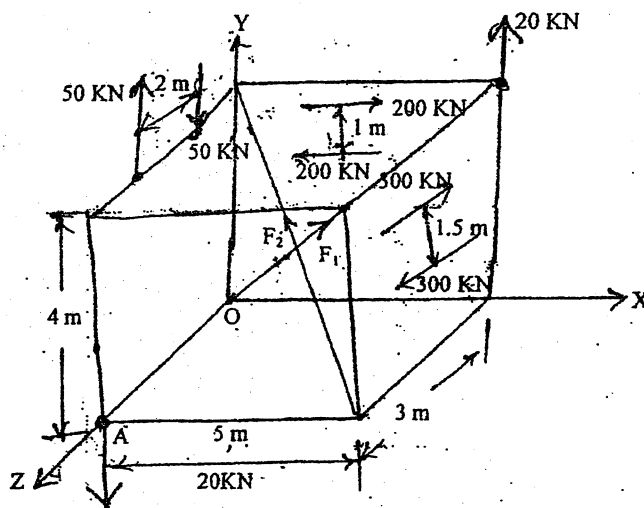

4. Determine by direct integration method, the centroid of the area shown in figure below: [5]
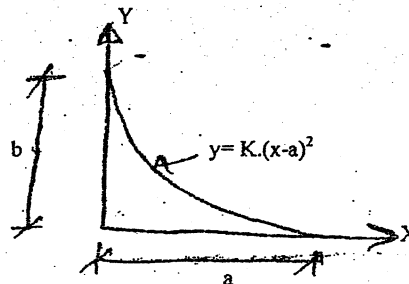
5. Calculate the moment of inertia of the composite area about Y-axis. [6]

75
150 mm
275 mm
100 | 100 mm

6. State laws of dry friction. How can we assume the condition of overturning and sliding of a block? Explain with suitable example. [2+3]

7. Draw axial force shear force and bending moment diagram for the given frame. Also indicate salient features if any. [14]

20 KN
30°
(Hinge) 5 KN/m
C   D
3 m
60°
10 KN B
3 m   E
10 KN/m
A
6 m
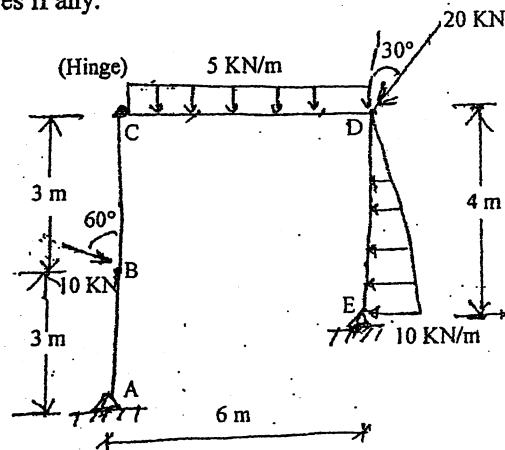
8. Find the member forces in CE, BE, BD and DE for the given truss. Define stability and determinacy of structures with examples. [5+3]

5 KN   10KN
D 30°
B   F
5 m
3 m
A   H
C   E   G
20 KN
5@4m=20m
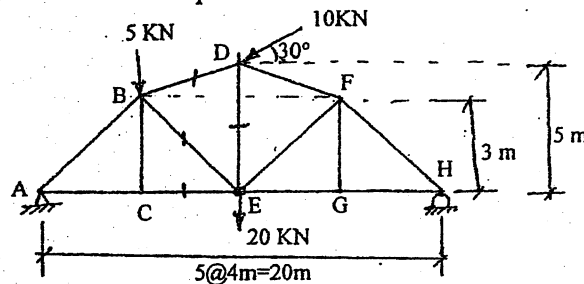
9. A projectile is aimed at a marked on the horizontal plan through the point of projection and falls 10 shorts when the angle of projection is 15° while overshoots the mark by 25 m when the inclination is 40°. Calculate the distance of the target and required angle of projection, if the velocity remains constant. Neglecting air resistance. Define dependent motion of particle with example. [8+2]

Y
V_o
O
α
X
10 m   25 m
x
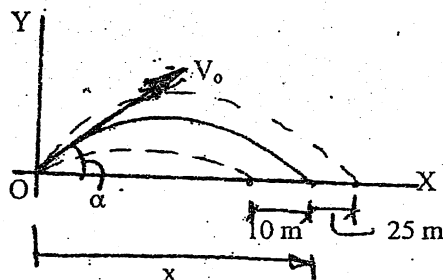
10. Define the dynamic equilibrium. Determine the velocity and acceleration of the particle, if it moves along a curved path defined by $r = 5\theta$ and $\theta = t^2/3$, where r is in meters and t is in seconds. Given that the instant angle is $\theta = \pi/2$. [2+8]

***