

FACULTY OF ENGINEERING & INFORMATICS

B.E. I-Year (Backlog) Examination, June / July 2017

Subject : Engineering Mechanics

Time : 3 hours

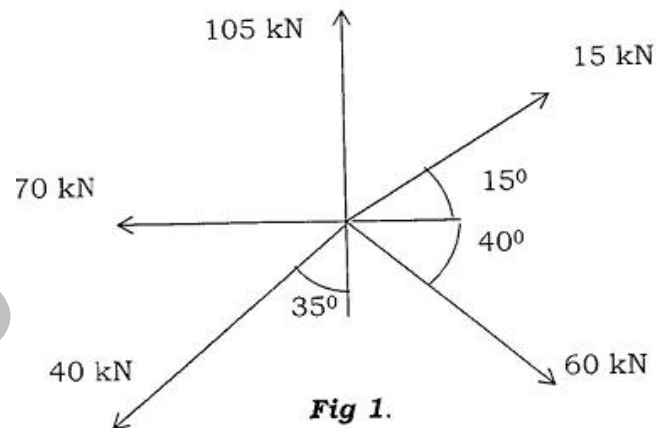
Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.**PART – A (25 Marks)**

- 1 Define moment of a couple. Give an example. 2
- 2 State the principle of transmissibility and Varignon's theorem. 3
- 3 Write the equilibrium equations in spatial system of forces. 3
- 4 Write short note on cone of friction. 2
- 5 The centroid of a semi-circular arc of radius r is : 2
 - a) $4r/3\pi$ b) $3r/4\pi$ c) $2r/\pi$ d) $2\pi/r$
- 6 State and prove the perpendicular axis theorem of MI. 3
- 7 State the D' Alembert's principle. 2
- 8 Differentiate between kinematics and kinetics of a particle motion. 3
- 9 The kinetic energy of a rotating body depends on _____ and _____. 2
- 10 A spring is stretched by 60 mm by the application of a force. Find the work done, if the force required to stretch 1 mm of the spring is 10 N. 3

PART – B (50 Marks)

- 11 a) Determine the resultant of the concurrent forces shown in Fig.1. 5



- b) Find the least value of force P required to overcome an obstacle 20cm high to a roller weighing 100 kN and 40cm radius. Also, find the reaction at the block? 5

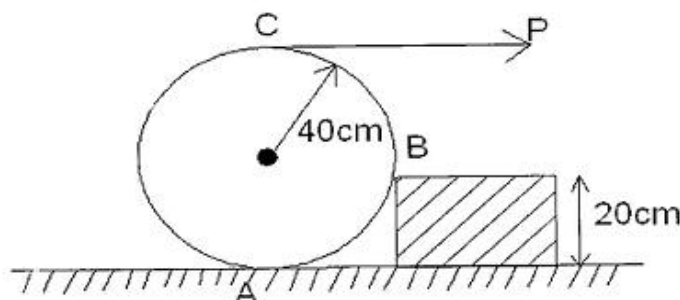
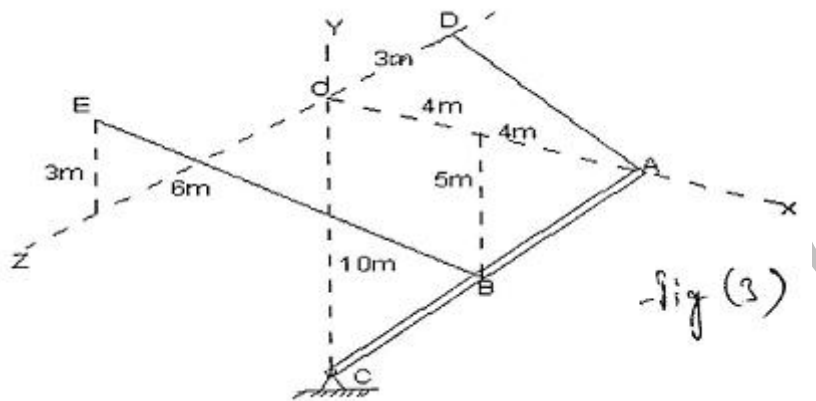


fig (2)

- 2 -

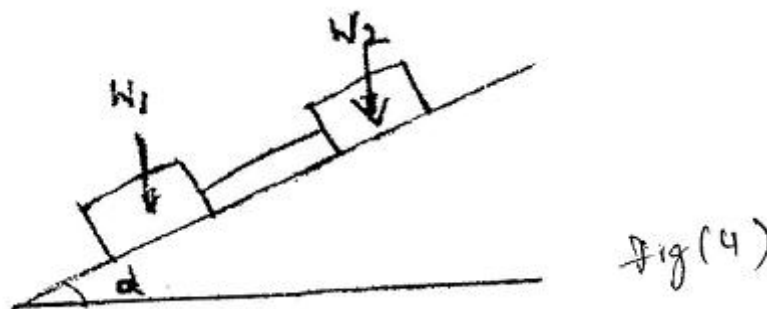
- 12 For the system shown in figure.3, the force multiplier of P acting from A to E is $P_m = 100 \text{ N/m}$. Determine the following.

5+5

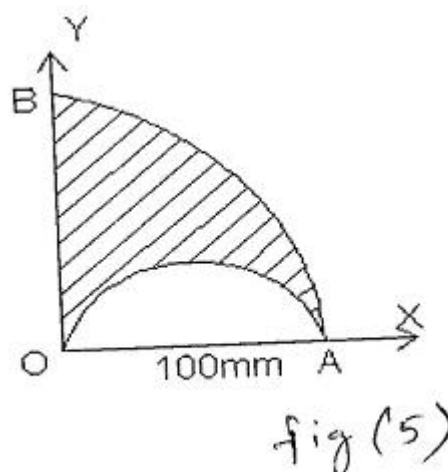


- a) Component of force P along AC b) Moment of P about C.

- 13 Two blocks of weights W_1 and W_2 connected with a string rest on a rough incline as shown in fig.4. If the co-efficient of friction are 0.2 and 0.25 for the blocks respectively and $W_1 = W_2 = 75 \text{ N}$, find the value of angle of slope ' α ' for which sliding will impend.



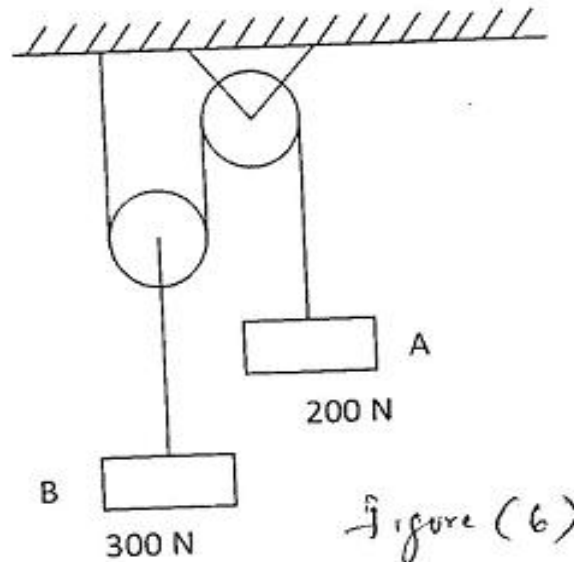
- 14 a) State and prove the PAPPUS's theorem I and II. 4
b) Locate the Centroid of hatched plate about the axes shown in fig.5. 6



- 3 -

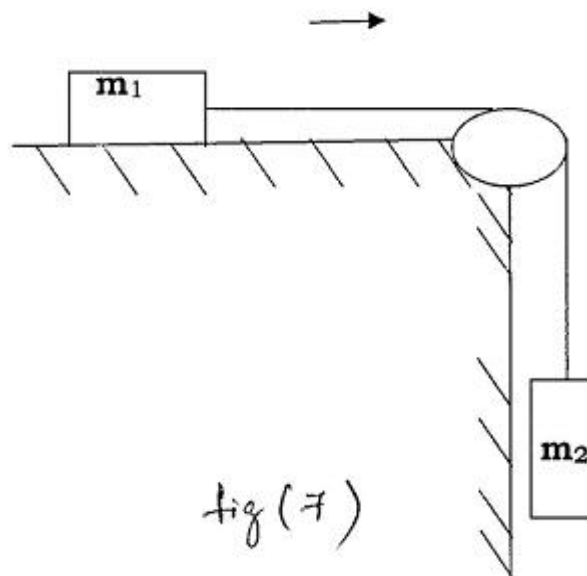
- 15 Determine the distance moved by A in changing the velocity from 2 m/s to 4 m/s. refer the figure.6.

10



- 16 Two masses ($m_1 = 30 \text{ kg}$, $m_2 = 15 \text{ kg}$) are interconnected with an inextensible cord as shown in fig.(7), considering coefficient of friction in contact surfaces as 0.3, determine the acceleration and tension of the string.

10



..4

- 17 a) Derive from first principles the moment of inertia of a right angled triangle about the base. 5
- b) A 12m bar of negligible weight rests in a horizontal position on the smooth inclines as shown in fig.8. Compute the distance 'x' at which load, $T = 150\text{ N}$ should be placed from right end of the bar to keep it horizontal. 5

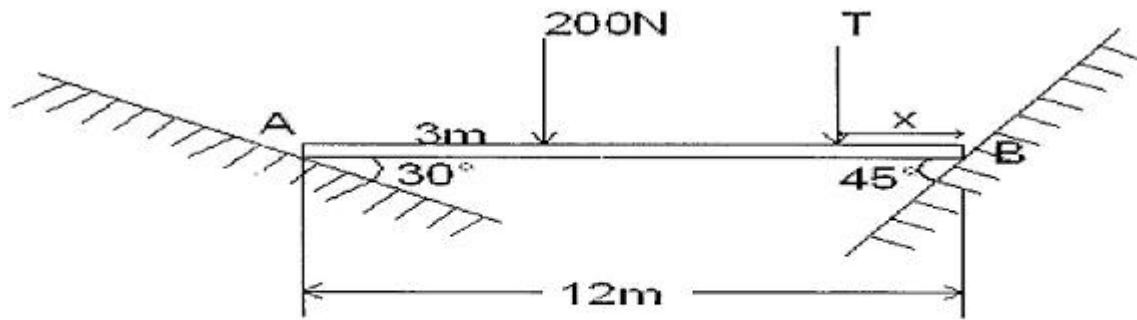


fig (8)

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