

3E1116

Roll No. _____

Total No of Pages: **3****3E1116****B. Tech. III - Sem. (Main / Back) Exam., Dec. 2019****ESC Mechanical Engineering
3ME3-04 Engineering Mechanics
Common For AE, ME****Time: 2 Hours****Maximum Marks: 80***Instructions to Candidates:*

Attempt all five questions from Part A, four questions out of six questions from Part B and two questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

*Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)*

1. NIL2. NIL**PART - A****(Answer should be given up to 25 words only)****[5×2=10]****All questions are compulsory**~~Q.1~~ What is Engineering Mechanics?~~Q.2~~ Explain the principle of virtual work.

Q.3 What is area moment of inertia for disk?

~~Q.4~~ Explain the Newton's second law.

Q.5 How couple works?

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PART - B

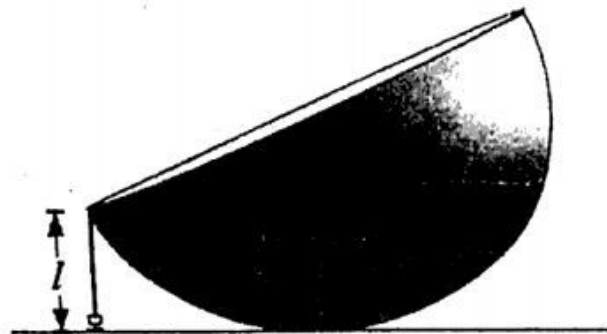
(Analytical/Problem solving questions)

[4×10=40]

Attempt any four questions

Q.1 State and explain the Varignon's theorem.

~~Q2~~ A hemisphere of radius r and weight W is placed with its curved surface on a smooth table and a string of length l ($< r$) is attached to a point on its rim and to a point on the table as shown in Figure. Find the tension of the string.



Q.3 Derive an expression for the length of the cross belt.

~~Q4~~ A sphere is fired horizontally into a viscous liquid with an initial velocity of 27 m/s , as shown in Figure. If it experiences a deceleration $a = -6t \text{ m/s}^2$, where t is in seconds, determine the distance travelled before it stops.



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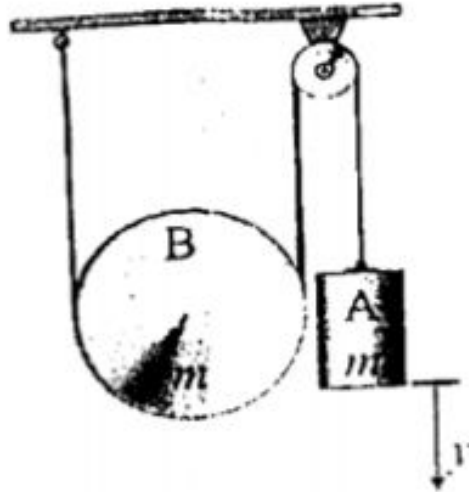
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Q.5 Define the angle of friction and angle of repose.

Q.6 If the system shown in figure is released from rest, find:

- (a) velocity v of the falling block A as a function of v .
- (b) tensions of the string.



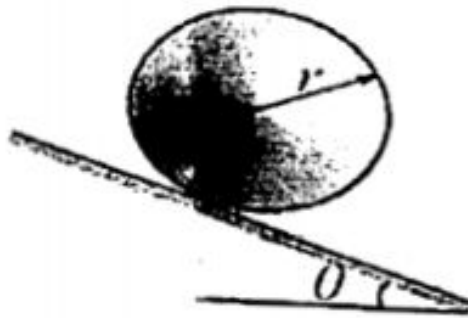
PART - C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

Q.1 Determine the moment of inertia of a thin elliptical disk of mass m , having axial radius of a and b .

Q.2 Find the minimum value of the coefficient of friction between a body and a plane, so that the body may roll without slipping. As shown in Figure, the radius of gyration and radius of body are k and r , respectively.



Q.3 Write short note on -

- (a) Principle of work and energy
- (b) Conservation of Energy