

2E2005

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B.Tech. (Sem.II) (Main/Back) Examination - 2014
205 Engineering Mechanics

[Time : 3 Hours]

[Total Marks : 80]

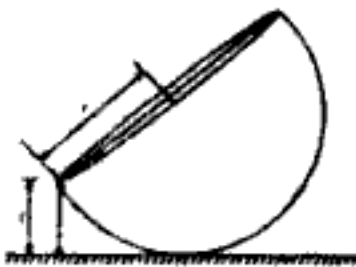
[Min. Passing Marks : 24]

Instructions to Candidates :

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Unit - I

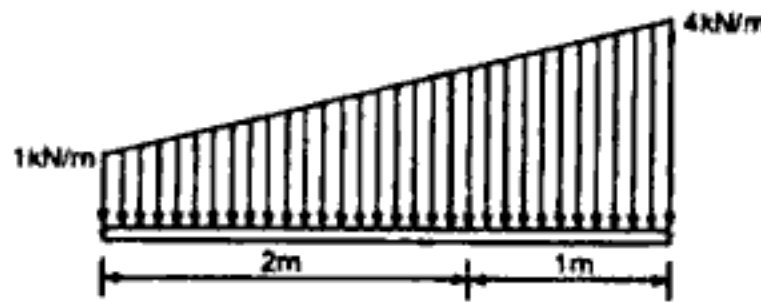
- 1. (a) State and prove Lami's theorem. What are the limitations of Lami's theorem to find out resultant of forces. (4+2)
- (b) A hemisphere of radius 'r' and weight 'W' is placed with its curved surface on smooth table and a string of length $l (< r)$ is attached to a point on its rim and to a point on table as shown in figure. Prove that tension in string $T = \frac{3W}{8} \times \frac{r-l}{\sqrt{2rl-l^2}}$.



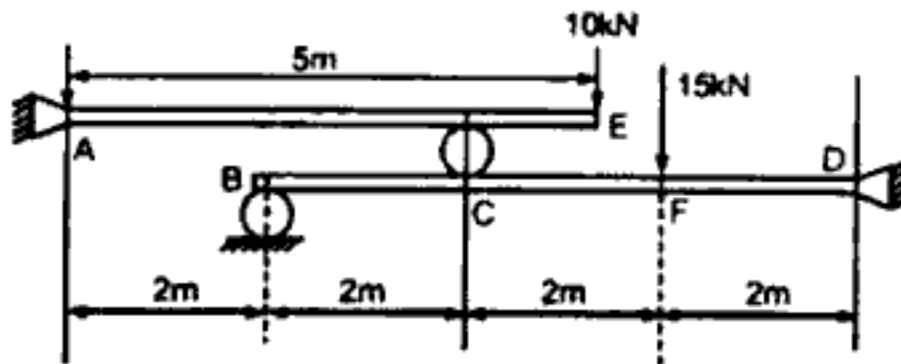
(10)

OR

- 1. (a) Determine reaction at beam support for given loading conditions.



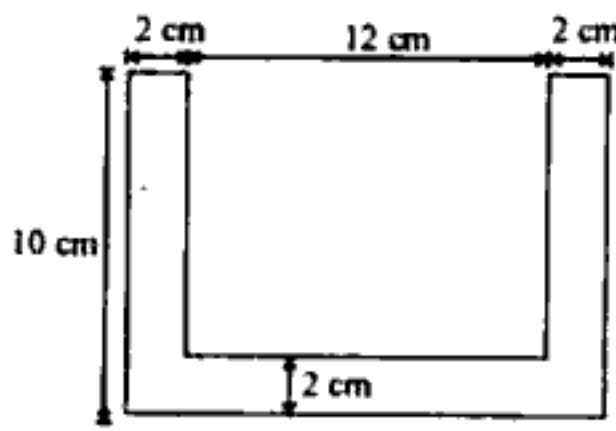
- (b) Determine reaction value at the roller support B and C using virtual work method.



(8)

Unit - II

- 2. (a) State following theorems concerning moment of inertia for a plane area:
 - (i) Parallel axes theorem
 - (ii) Perpendicular axes theorem
 (2+2)
- (b) Find area moment of inertia of section shown in figure, about x-axis and y-axis passing through centroid of the section.



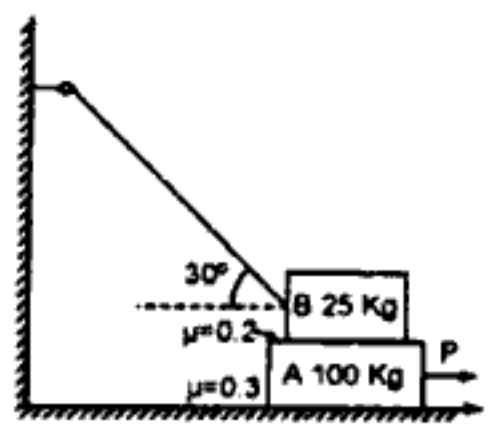
(12)

OR

2. (a) How does the mechanical advantage and efficiency varies with load? (6)
- (b) A single purchase winch crab has the following particulars : (6)
- Number of teeth on pinion = 16
 - Number of teeth on spur wheel = 96
 - Length of lever arm = 70 cm
 - Diameter of load drum = 20 cm
- It is observed that an effort of 60 N lifts a load of 1800 N and an effort of 120N lifts load of 3960N.
- (i) Find efficiency in two cases (5)
 - (ii) Determine loss of load and loss of effort in two cases. (5)

Unit - III

3. (a) A ladder of mass 35 Kg and length 10 m rest against a vertical wall and it is inclined at 60° to horizontal. The coefficient of friction for all surfaces is 0.25. How far up the ladder can a 72 kg person climb before the ladder begins to slip. (8)
- (b) Block A of mass 100 kg rests on horizontal surface and supports another Block B of mass 25 kg on top of it. Block B is attached to a vertical wall by on inclined string as shown in figure. Determine force P applied to lower block that will necessary to cause slipping to impend. (8)



OR

- (a) Drive expression for length of belt of a cross belt drive. (8)
- (b) Two pulleys of diameter 0.6 m and 0.3 m connected by cross belt drive are 3.5 m apart. Power transmitted is 5 KW. The permissible load on belt is 2.5 N/mm width of belt, larger pulleys make 220 rpm, thickness of belt is 5 mm, and coefficient of friction between belt and pulley is 0.35. Determine. (2)
- (i) Length of belt (4)
 - (ii) Width of belt (2)
 - (iii) Initial tension in belt (2)