

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)**

**CLASS: B.ARCH  
BRANCH: ARCHITECTURE**

**SEMESTER: II  
SESSION: SP/2020**

**SUBJECT: AR153 STATICS AND STRENGTH OF MATERIALS**

**TIME: 2 HOURS**

**FULL MARKS: 25**

**INSTRUCTIONS:**

1. The total marks of the questions are 25.
2. Candidates may attempt for all 25 marks.
3. Before attempting the question paper, be sure that you have got the correct question paper.
4. The missing data, if any, may be assumed suitably.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

- |  |     |     |                           |
|--|-----|-----|---------------------------|
| <p>Q1 (a) Explain the term: "Free Body Diagram".</p>   | [2] | CO1 | BL<br>L2                  |
| <p>Q1 (b) Two identical spheres are kept in a horizontal channel of width 105 cm as shown in Fig. 1. Determine the reactions coming from all contact surfaces. Consider the radius of the spheres as 27 cm and the weight 540 N.</p> | [3] | CO1 | Understand<br>L3<br>Apply |

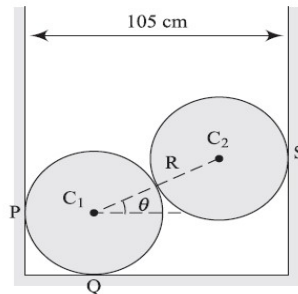


Fig.1

- |   |     |     |                  |
|---|-----|-----|------------------|
| <p>Q2 (a) State and explain the theorem of Varignon.</p>  | [2] | CO1 | L2<br>Understand |
| <p>Q2 (b) A heavy cylinder of mass 280 kg is to be pulled over a curb of height 5 cm. by a horizontal force F applied by means of rope wound around the cylinder. Determine the magnitude of pull for impending motion over the curb, while the radius of the cylinder 13 cm.</p> | [3] | CO1 | L3<br>Apply      |

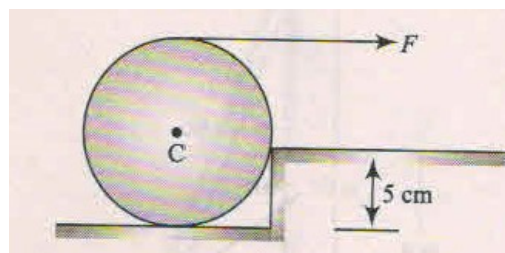


Fig.2

- |   |     |     |                |
|---|-----|-----|----------------|
| <p>Q3 (a) Define truss. Write the relation between the members and joints of a perfect truss.</p> | [2] | CO2 | L1<br>Remember |
|---|-----|-----|----------------|

**PTO**

Q3 (b) Evaluate the axial forces in the members AD, AE of the loaded cantilever truss ADBEC as shown in Fig. 3 (One end fixed, other end free)

[3] CO2 L5 Evaluate

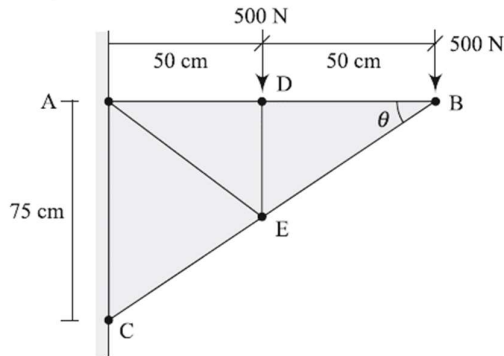


Fig. 3

Q4 (a) Explain over-rigid truss and under-rigid truss.

[2] CO2 L2 Understand

Q4 (b) Evaluate the forces induced in the members DB, DE and AB of the plane truss as shown in Fig. 4.

[3] CO2 L5 Evaluate

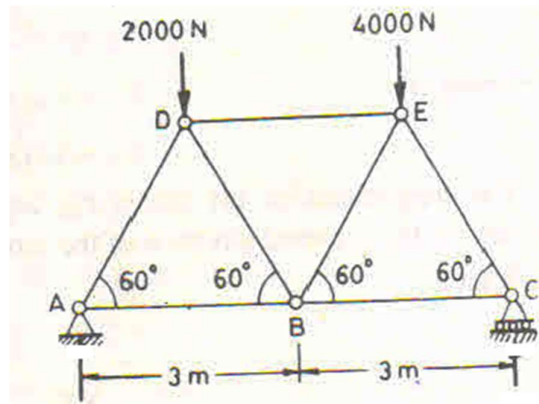


Fig. 4

Q5 (a) From the first principle calculate the centroid position of a rectangular area.

[2] CO3 L3 Apply

Q5 (b) Determine the centroid of the area OABCDE (shaded area) shown in Fig. 5

[3] CO3 L3 Apply

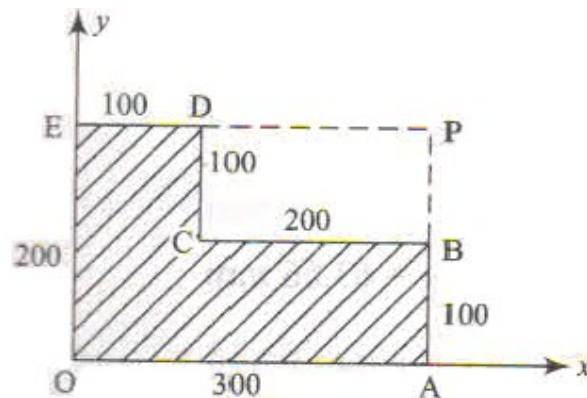


Fig. 5 (All dimensions are in mm.)