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

CLASS: BTECH                                                                SEMESTER: II
BRANCH: BT/CHEMICAL/CP&P/CIVIL/MECH/PROD                SESSION: SP/2020

**SUBJECT: ME101 BASICS OF MECHANICAL ENGINEERING**
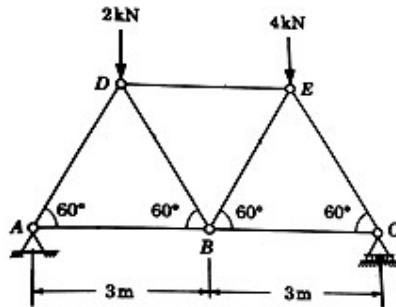
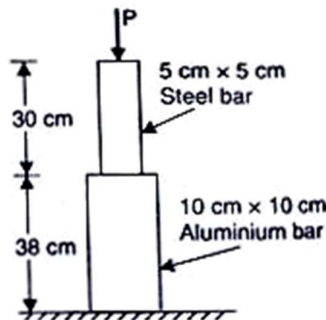TIME:    2 HOURS                                                       FULL MARKS: 25

**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.

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|  |  |  | CO | BL |
|---|---|---|---|---|
| Q1 | (a) | State the assumptions for simple truss analysis. | [2] | 1 | L-1 |
| Q1 | (b) | Determine the axial force in the members DE and DB of the truss as shown below. | [3] | 1 | L-3 |



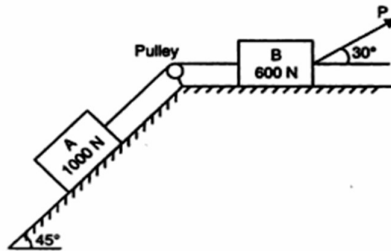| Q2 | (a) | Define volumetric strain, and tensile strength of a material. | [2] | 1 | L-1 |
| Q2 | (b) | A member formed by connecting a steel bar to an aluminium bar is shown below. Assuming that the bars are prevented from buckling sideways. Determine the magnitude of force that will cause the total length of the member to decrease 0.25 mm. The values of elastic modulus for steel and aluminium are $2.1 \times 10^5$ N/mm$^2$ and $7 \times 10^4$ N/mm$^2$ respectively. | [3] | 1 | L-3 |



| Q3 | (a) | Define (a) uniform velocity, (b) non-uniform velocity, (c) relative velocity. | [2] | 2 | L-1 |
| Q3 | (b) | Two ships (S1) and (S2) are at a given instant 6 km, away from each other, S2 being SE of S1. S1 is travelling at 12 km/hr, due East and S2 is travelling at 20 km/hr, due North. Determine (a) The velocity of S2 relative to S1, (b) The shortest distance between the two ships and (c) The time when the two ships are nearest. | [3] | 2 | L-3 |

Q4 (a) Explain Newton's law for rotary motion. [2] 2 L-2

Q4 (b) A cylinder of radius 1m rolls without slipping on a horizontal plane AB as shown [3] 2 L-3
below. Its centre has uniform velocity of 20 m/sec. Determine the velocity of
the points E and F on the circumference of the cylinder.
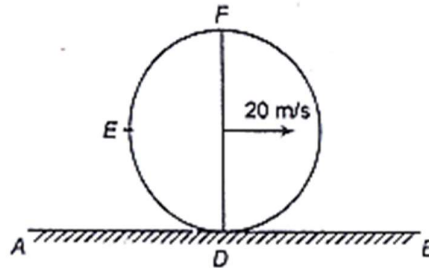


Q5 (a) Define angle of friction. [2] 4 L-1

Q5 (b) Determine for what value of the pulling force P in the system as shown below, [3] 4 L-3
will be required for motion to impend from left to right ? Assume the pulley
to be smooth and coefficient of friction between the mating surfaces be 0.30.



**::::: 02/03/2020M ::::::**