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| **Name:**<br>**Enrolment No:** | |

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**
**End Semester Examination, December 2022**

**Course: Engg. Mechanics** **Semester: III**
**Program: B.Tech EE, CERP, FSE, Civil** **Time : 03 hrs.**
**Course Code:** MECH2032 **Max. Marks: 100**

**Instructions: All the questions are compulsory.**

**SECTION A**
**(5Qx4M=20Marks)**

| S. No. | | Marks | CO |
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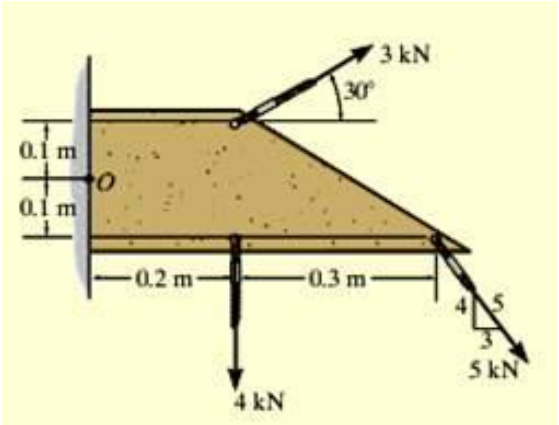
| 1 | Replace the loading on the frame given in figure by its resultant in magnitude and position.<br>  | **4** | **CO1** |
| 2 | Define a perfect frame. Also discuss at least four differences between method of section and method of joint for the analysis of truss. | **4** | **CO1** |
| 3 | Draw the free body diagram of the bar AB. | **4** | **CO1** |

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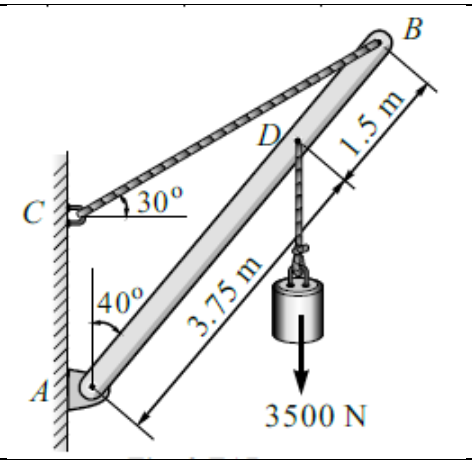
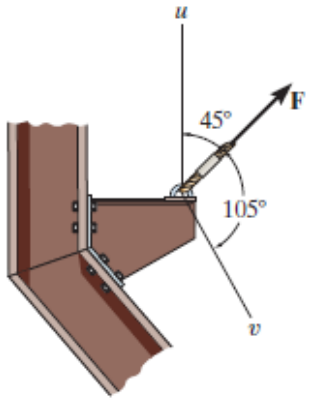
| |  | | |
| 4 | If force F is to have a component along the u axis of 6 kN, determine the magnitude of F and the magnitude of its component along v axis.<br>  | **4** | **CO1** |
| 5 | The equation of motion of an engine is given by $s = 2t^3 – 6t^2 – 5$, where (s) is in metres and (t) in seconds. Calculate (a) displacement and acceleration when velocity is zero ; and (b) displacement and velocity when acceleration is zero. | **4** | **CO1** |
| **SECTION B<br>(4Qx10M= 40 Marks)** | | | |
| 6 | A uniform ladder of 4 m length rests against a vertical wall with which it makes an angle of 45°. The coefficient of friction between the ladder and the wall is 0.4 and that between ladder and the floor is 0.5. If a man, whose `weight is one-half of that of the ladder ascends it, compute the distance ascended by the man when the ladder slips. | **10** | **CO2** |

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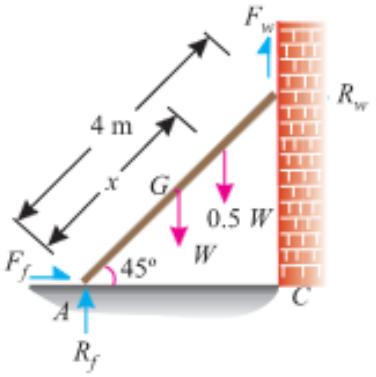
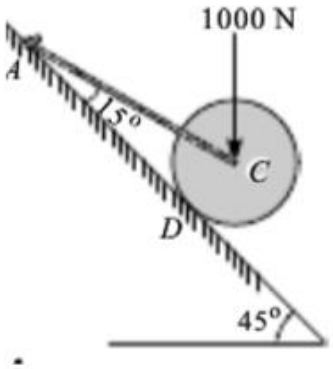
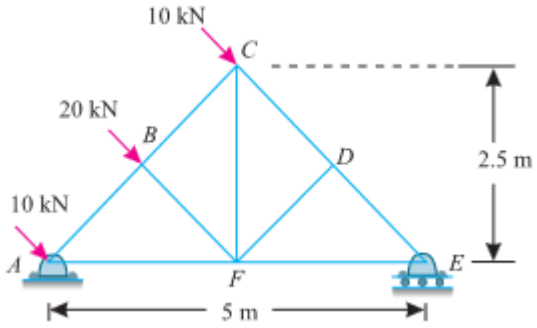
| |  | | |
| 7 | For the system shown in figure, find the tension in the cable and reaction at the support.<br>  | **10** | **CO2** |
| 8 | Find the forces in the members AB, BC, BF and FD of truss in magnitude and direction.<br>  | **10** | **CO2** |

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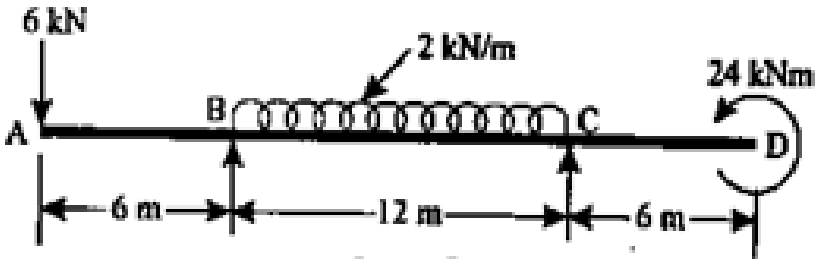
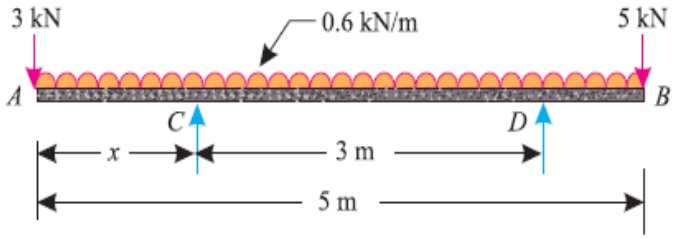
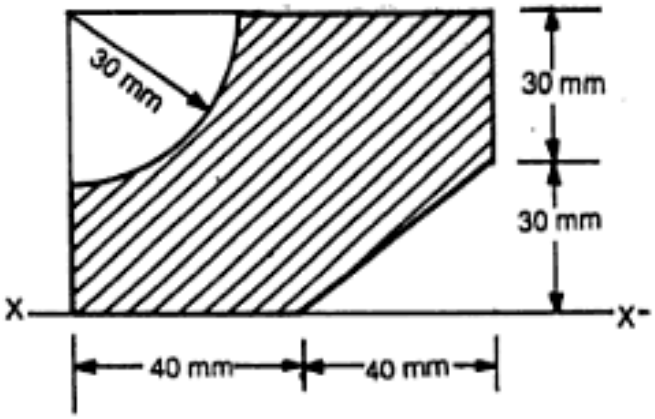
| 9 | A beam ABCD is loaded as shown in figure below. Determine the reactions at the supports at points B and C.<br>  <br><br>OR<br>A beam AB 5 m long, supported on two intermediate supports 3 m apart, carries a uniformly distributed load of 0.6 kN/m. The beam also carries two concentrated loads of 3 kN at left hand end A, and 5 kN at the right hand end B as shown in figure. Determine the location of the two supports, so that both the reactions are equal.<br>  <br> | **10** | **CO2** |
| | **SECTION-C**<br>**(2Qx20M=40 Marks)** | | |
| 10 | Find the moment of inertia of the shaded portion:<br><br>(a) about the given axis X-X and;<br>(b) about the centroidal axis parallel to the given X-X **axis**<br>  <br><br>**OR** | **20** | **CO3** |

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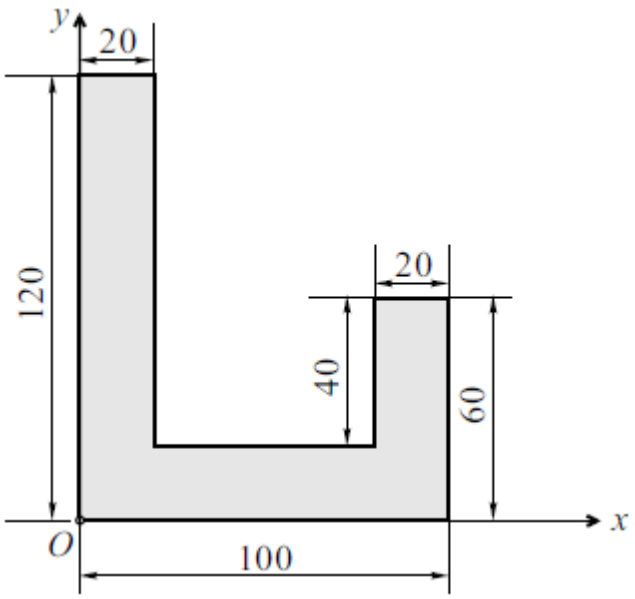
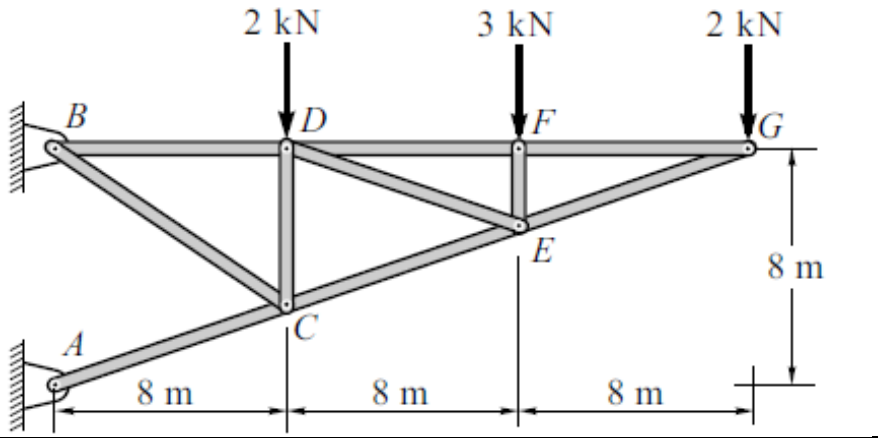
| | For the given shaded area shown in find,<br>(i) MI about the reference axes (i.e., Ox and Oy axis).<br>(ii) MI about the centroidal axis.<br>  <br> | | |
| 11 | Find out the force in the members of the truss shown in figure below by using method of section.<br>  <br> | **20** | **CO3** |