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B.Tech. MECHANICAL ENGINEERING (COMPUTER INTEGRATED MANUFACTURING)/ B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination, 2019

BME-016 : ENGINEERING MECHANICS

Time : 3 Hours   Maximum Marks : 70

Note : Answer **any five** questions. All questions carry **equal marks**. Use of scientific calculator is permitted. Assume missing data, if any.

1. (a) The side of a regular hexagon ABCDEF is 0.6m. Forces 1N, 2N, 3N, 4N, 5N and 6N are acting along the sides AB, CB, DC, DE, EF and FA respectively. Find the resultant moment of all forces about the point A. [10]

   (b) Define a 'Couple' and enlist its properties. [4]

2. (a) Describe laws of friction. [4]

   (b) Find the force P needed to start block B shown in Fig. 1 moving to the right if the coefficient of

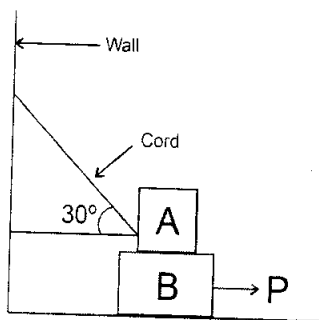friction is 0.3 for all surfaces of contact. Block A weighs 80N and block B weighs 160 N. [10]
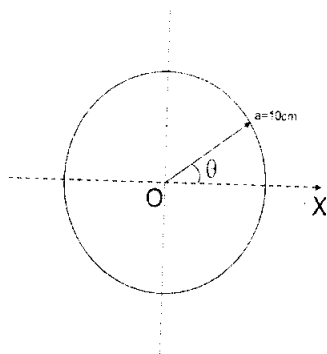

Fig. 1

3. Determine moment of inertia of circular area of radius a = 10 cm about its centroidal axis OX as shown in fig. 2.

[14]

Fig. 2

4. (a) A wheel of 0.5m radius rolls over a horizontal surface without slipping as shown in Fig. 3 . The horizontal velocity of its centre is 2m/s which is constant. Calculate the angular velocity of the wheel and velocities at C, D and E. [7]
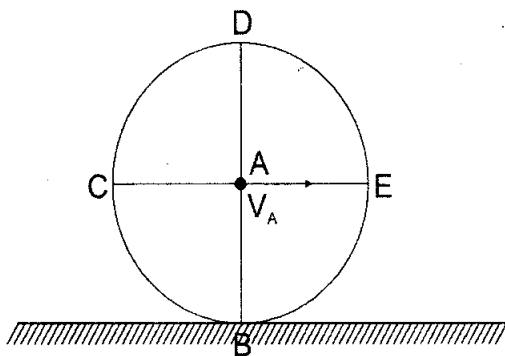

Fig. 3

(b) Explain the following : [7]

(i) Principle of conservation of energy

(ii) Conservative forces

5. (a) Blocks A and B of mass 20 Kg and 45 Kg. respectively are connected by a weightless rope over a frictionless pulley as shown in Fig. 4.

Assume a coefficient of friction of 0.2 for all the planes. Determine the velocity of the system 5 seconds after starting from rest. [7]
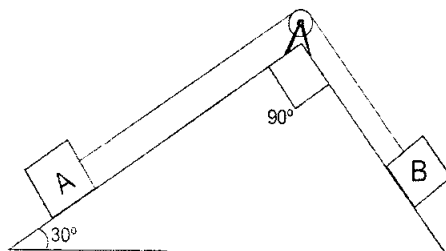

Fig. 4

(b) What do you understand by a "Free Body Diagram". Explain with example. [7]

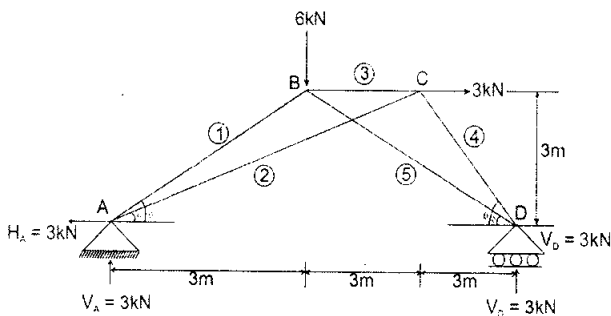6. For a simply supported truss shown in fig. 5. Find the nature and magnitude of force in all its members. [14]

Fig. 5

7.   (a)   Explain would you differentiate between reversible and irreversible machine on the basis of efficiency.   [7]

     (b)   An effort of 400N is applied in a lifting machine. The distance moved by effort is 4m and that by load is 40cm. If the efficiency of the lifting machine is 70%, determine :   [7]

           (i)   Load lifted by machine

           (ii)   Mechanical advantage

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