Printed Pages: 7 | 536 | NME-102

(Following Paper ID and Roll No. to be filled in your Answer Book)

Paper ID :140102 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. I) THEORY EXAMINATION, 2015-16

ENGINEERING MECHANICS

[Time:3 hours] [Total Marks:100]

Section-A

Q.1 Attempt **all** parts. All parts carry equal marks. Write answer of each part in short (2x10=20)

(a) What is static equilibrium ? Write down sufficient condition of static equilibrium for a Coplanar concurrent and non-concurrent force system.

(b) Write any four engineering applications of friction.

(c) Differentiate between perfect and imperfect truss.

(d) What do you understand by point of contra-flexure?

(e) State perpendicular axis theorem.

(f) What do you understand by radius of gyration ?

(g) Write the different types of motion.

(h) What do you understand by Work-Energy principle?

(i) What do you mean by strain energy ?

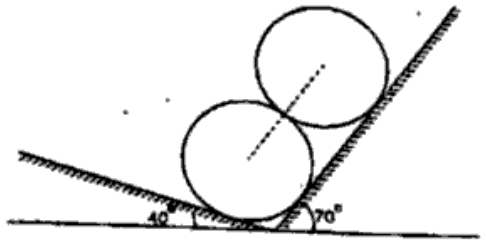
(j) State D-Alembert's principle.

Section-B

Note: Attempt **any five** questions from this section :

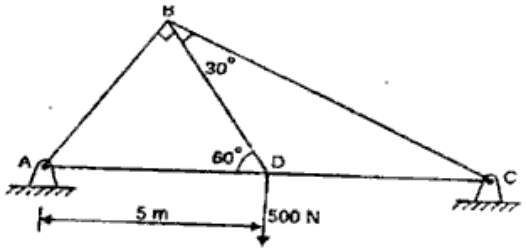
(10 x 5 = 50)

Q2. Two identical rollers, each of weights 1000 N are supported by an inclined plane as shown in fig.1. Assuming smooth surfaces, find the reactions induced at the points of supports.



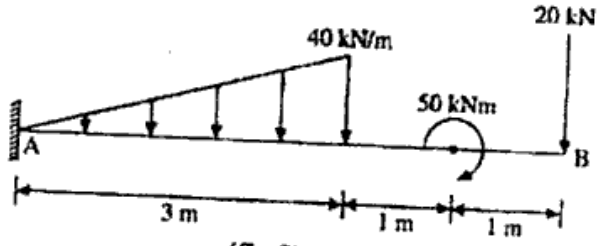
(fig.1)

3. Compute the forces in all the members for the given truss as shown in fig.2. Distance between A and C is 12m.



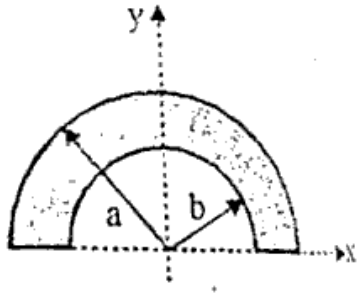
(fig.2)

4. Calculate the support reactions in the given cantiliver beam as shown in fig.3.



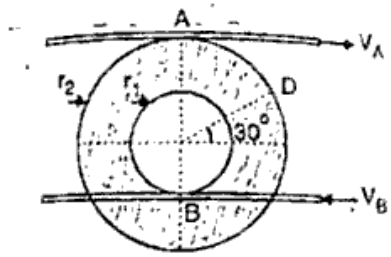
(fig.3)

5. For the semi-annular area shown in fig. 4, determine the ratio of a to b so that $\bar{y} = \frac{3}{4}b$.



(fig.4)

6. A compound wheel rolls without slipping between two parallel plates A and B as shown in fig. 5. At the instant A moves to the right with a velocity of 1.2 m/s and B moves to the left with a velocity of 0.6 m/s. Calculate the velocity of center of wheel and the angular velocity of wheel. Take $r_1 = 120$ mm and $r_2 = 360$ mm.



(Fig. 5)

7. A wheel that is rotating at 300 rpm attains a speed of 180 rpm after 20 seconds. Determine the acceleration of the flywheel assuming it to be uniform. Also determine the time taken to come to rest from a speed of 300 rpm if the acceleration remains the same and number of revolutions made during this time.

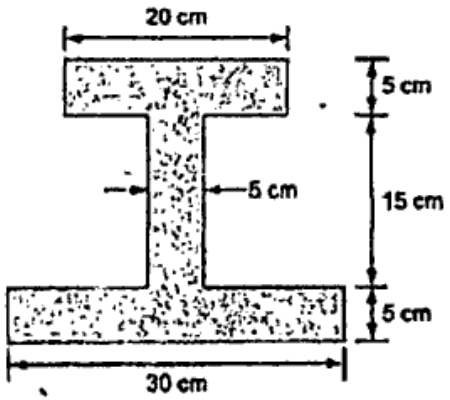
8. Determine the safe diameter of solid shaft which will transmit 450 kW at 300 rpm. The angle of twist must not exceed 1° per metre length and the maximum torsional shear stress is limited to 40 N/mm². Assume modulus of rigidity to be 80 N/mm².

9. Derive the expression for mass moment of inertia of a sphere about centroidal axis.

Section-C

Note : Attempt any two questions from this section.(15x2=30)

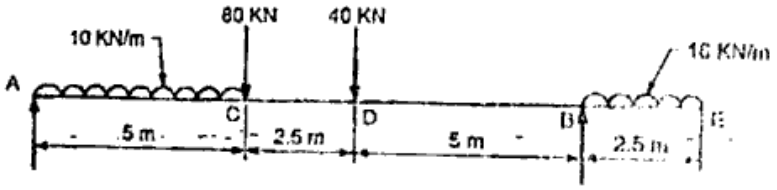
10. Determine the moment of inertia about x-x and y-y axis passing through the centroid of the unsymmetrical I-section as shown in fig. 6



(fig.6)

11. Derive the Bending equation. A cast iron water main 500 mm external diameter and 25 mm thickness is running full and is simply supported 30 m apart. Determine the bending stress produced in the material if the specific weight of cast iron and water are 18500 kG/m³ and 1000 kG/m³ respectively.

12. For the beam shown in fig.7 draw the shear force and bending moment diagram. Determine the position of maximum bending moment. Also determine the point of contra-flexure if any.



(fig.7)

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