PAPER ID-311666

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B TECH
(SEM-I) THEORY EXAMINATION 2020-21
ENGINEERING MECHANICS

Time: 3 Hours ***Total Marks: 100***

Note: Question Paper is divided into three parts, all parts are compulsory. Marks are indicated at each part. Assume if any Data Missing.

Q. No. 1- Attempt any four parts. **[4x5 =20]**

a) State and prove varignon's theorem.

b) If the force F shown in Fig. P-017 is resolved into components parallel to the bars AB and BC, the magnitude of the component parallel to bar BC is 4 kN. What are the magnitudes of F and its component parallel to AB?

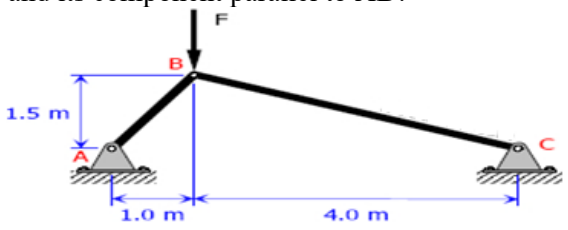

Figure P-017

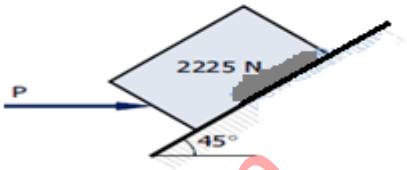

Figure P-507

c) The 2225-N block shown in Fig. P-507 is in contact with 45° incline. The coefficient of static friction is 0.25. Compute the value of the horizontal force P necessary to just prevent motion down the incline.

d) A 1000 N cylinder supported by a horizontal rod AB and a smooth uniform rod CD which weighs 500 N (figure 508). Assuming A B C and D to pin jointed and weight of AB is negligible, Find reaction C and D.

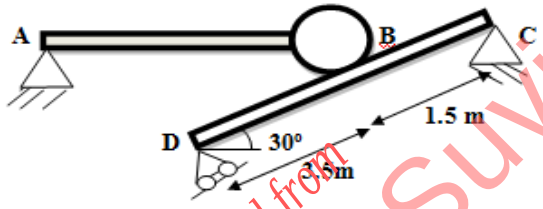

Fig.508

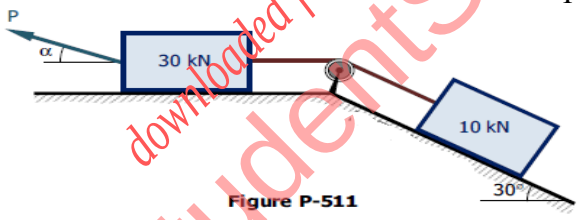

Figure P-511

e) Find the least value of P required to cause the system of blocks shown in Fig. P-511 to have impending motion to the left. The coefficient of friction under each block is 0.20

Q. No. 2- Attempt any two parts. **[10x2=20]**

a) Find the force in each member of the truss in figure T-01.

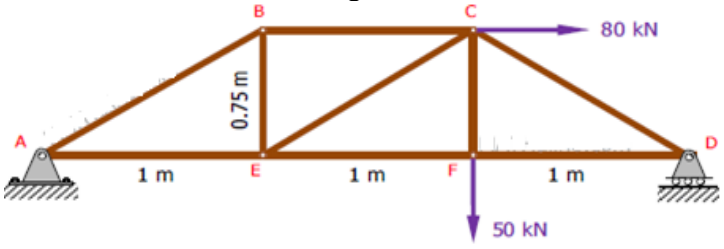

Figure T-01

b) Draw SFD and BMD for the overhanging beam Fig b.

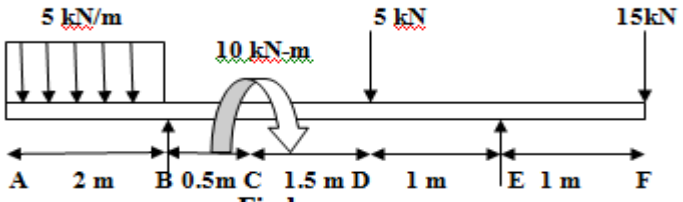

Fig b

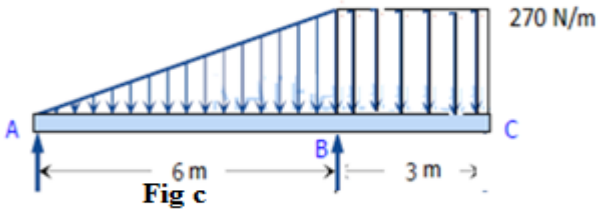

Fig c

c) Find the expression for Shear Force and Bending Moment, hence draw the SFD and BMD Fig c.

Q. No. 3- Attempt any two parts. **[10x2=20]**

a) Find the centroid for a triangle and sector of a circle figure 3(a).

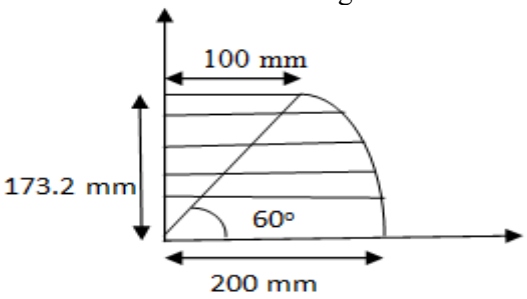

Figure 3(a)

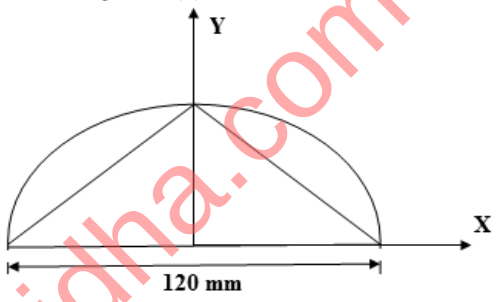

Figure 3(b)

b) Find the polar moment of inertia of a semicircle about its centre from which a triangle base 120mm and height 60 mm is removed as shown in the figure 3(b).

c) Find the mass moment of inertia of a sphere about its centre and mass moment of inertia of a cone about its axis of rotation.

Q. No. 4- Attempt any two parts. **[10x2=20]**

a) Find the tension in the string and acceleration of blocks A and B weighing 200 N and 50 N respectively, connected by a string and frictionless and weightless pulley as in fig 4(a)

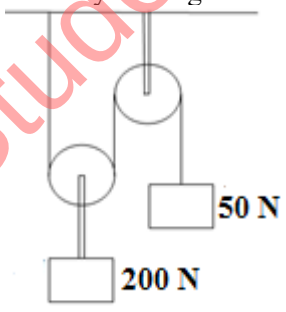

Figure 4(a)

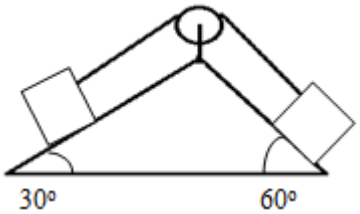

Figure 4(b)

b) Two equal weight of 3000 N (figure 4b) are lying on two inclined planes connected by a string passing over a frictionless pulley as shown. Using D'Alembarts principle, find the acceleration of the weights and tension in the string. μ= 0.2 for wedge.

c) **(i)** A fly wheel make 100 rev from a velocity 120 rpm to 160 rpm. Find the acceleration and time taken. Also find the total number of revolution if the fly wheel started from rest.
(ii) Acceleration of a particle is given by a=10-x. Particle starts from rest at x=0 v=0. Find the position when velocity is zero and the velocity when acceleration is zero.

Q. No. 5- Attempt any four parts. **[4x5 =20]**

a) State assumptions for Bending. Derive an expression for bending Equation.

b) A simply supported beam, 2 m wide by 4 m high and 12 m long is subjected to a concentrated load of 2000 N at a point 3 m from one of the supports. Determine the maximum fiber stress.

c) A steel propeller shaft transmitting 450 KW at 300 rpm without exceeding a shearing stress of 40 N/mm^2 or twisting through more than 1°per meter. Compute the proper diameter if G = 80 kN/mm^2.

d) Find the elongation for the tapered circular bar with given dimension in figure 5(d) also find the total strain energy.

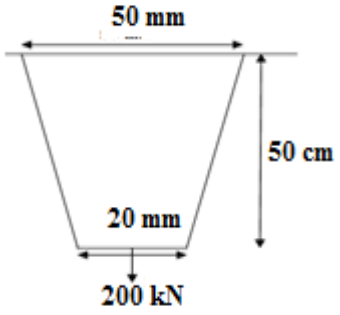

Figure 5(d)

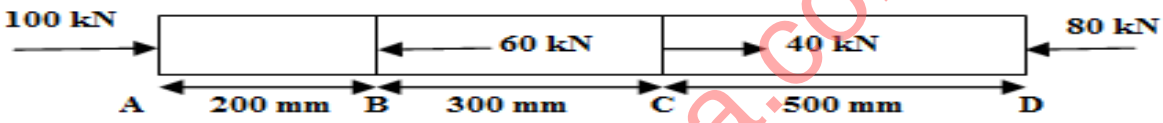

Figure 5(e)

e) A member ABCD of uniform diameter 200mm is loaded as shown in figure 5(e), find the net change in length if E=200GN/m^2.