GANPAT UNIVERSITY

K.P.B

B.Tech. 1st Semester – (MC/ME/Civil/Electrical),
Regular Examination : Nov- Dec : 2011

CI 102
Mechanics of Solids

Instructions: -

(1) Answer to the two sections must be written in separate answer books.
(2) Assume suitable data if required.
(3) Figures to the right indicate full marks.

Invigilator's Sign.: _____

Exam. No. of the candidate: _____

Max. Marks: 70

Max.Time: 3 Hours

Section - I

1 Attempt any Three: (12)

(A) Explain: Tensile test on Mild Steel.

(B) Derive relation between the rate of loading, shear force and bending moment in beam.

(C) Prove that the friction in a machine can be expressed by the following relation in terms of effort: Fp = (P x V.R) - W.

(D) (I) State the difference between fundamental units and derived units and

(II)Differentiate between resolution and composition of forces

2 Attempt any Two: (12)

(A) In a double purchase crab winch, number of teeth on spur wheels are 60 and 40 and number of teeth on pinion wheel are 20 and 30. The effort handle is 300 mm long and diameter of load drum is 150 mm, load of 250 N and 500 N are lifted by efforts of 25 N and 45 N respectively, calculate: (I) Velocity Ratio, (II) Law of machine and (III) Maximum Efficiency.

(B) Draw shear force and bending moment diagram for a cantilever beam 4.0 meter long with right end free and right end carries a axial point load of 3 N towards to fix end side.

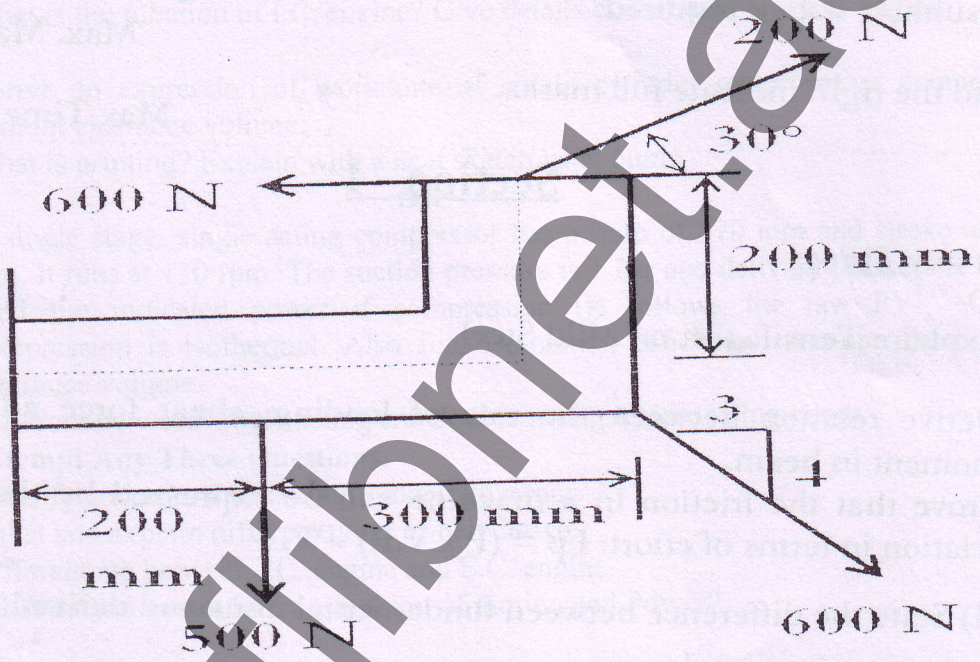
(C) Two pull forces 4F and 3F are acting on a body. If 4P force is increased by 25 % and 15 N is added to 3F force than the direction of the resultant remains unchanged. Find the value of F.

3 (A) State and explain: Perpendicular Axis Theorem. (04)

3 (B) A beam of angle-section of overall depth 150 mm, width of the horizontal leg is 100 mm and thickness of angle section 30mm. Calculate M.I. about x-x and y-y axis. (07)

OR

3 (B) Determine the sum of the moments of the forces about A of the force system in below figure. (07)



Section – II

4 Answer the following questions. (12)

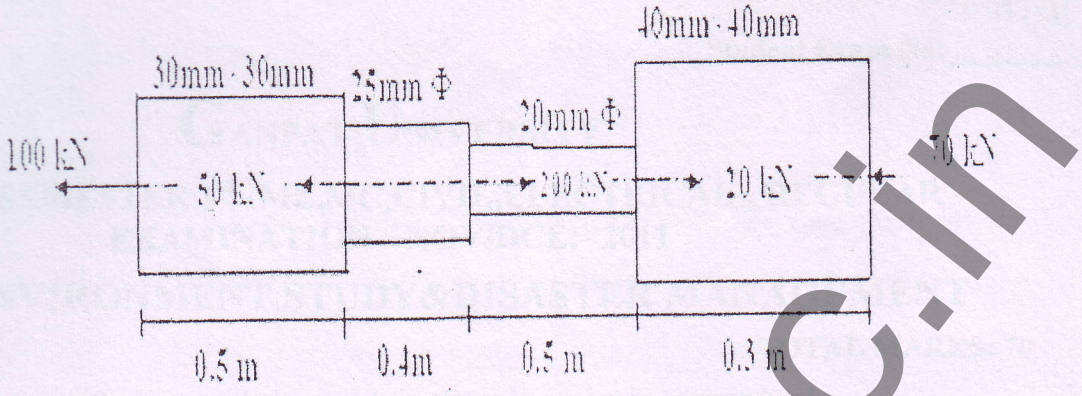
(A) Find the volumetric strain of a rectangular body.

(B) Derive the equation for the tension in the string, when one body is hanging free and the other is lying on a rough horizontal plane.

(C) Define: Safe stress, Thermal stress, Poisson's ratio, Working stress.

5 (A) Define: 'Free Body Diagram' and prove that, a body will not be in equilibrium under the action of two equal and opposite parallel forces. (06)

5 (B) Find out the total elongation of the bar subjected to forces as shown in the figure. Also find stresses in different sections. (6)



OR

5 (A) Define: Angle of repose, Static Friction, Dynamic Friction (06)

(B) A ladder of length 4m weighing 200N is placed against a vertical wall, which makes 60° with vertical wall. The co-efficient of friction between wall and ladder is 0.2 and that between floor and ladder is 0.3. The ladder in addition to its own weight has to support a man weighing 600N at a distance of 3 m from lower end. Calculate the minimum horizontal force to be applied at lower end of ladder to prevent slipping. (06)

6 (A) Explain 'Principle of equilibrium of a concurrent coplanar system'. (06)

(B) Two vertical rod one of steel and other of copper are rigidly fixed at top and are 500 mm apart. Diameter of each bar is 20 mm and length of each bar is 4m. A cross bar fixed to the rod at the lower end carries a load of 5000 N such that the cross bar remains horizontal. Find the tension in each rod and position of the load on the cross bar. Take $Es=2x10^5$ N/mm^2, $Ec=1x10^5$ N/mm^2. (05)

OR

6 (A) Define : Longitudinal strain ,Elasticity, Hook's law, Yield stress (06

(B) A steel bar 300 mm long, 50 mm x 12 mm in section is subjected to an axial pull of 84 KN. Determine change in length, width, thickness and volume of the bar. $E=2 x10^5$ N/mm^2, 1/m=0.32. (05

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