Student Exam No. B

GANPAT UNIVERSITY

B. Tech. Semester: I (ME/MC/CIVIL/EE) , Regular Examination - December 2013

2CI102 MECHANICS OF SOLIDS

Time: 3 Hours **Total Marks: 70**

Instruction: 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**

Section - I

1 Attempt any Two: **(12)**

(A) Five forces of magnitude 20 N, 40 N, 50 N, 80 N and 100 N are acting along the sides AB, BC, CD, DA and CA of a square ABCD having 3m sides. Find moment of forces about point A. Write ABCD in anticlockwise sense on square.

(B) Enlist and Explain " Types of Force Systems"

(C) Four coplanar forces acting at a point O are (1)200N inclined at 26° North of East, (2) 120 N inclined at 53° West of North, (3) 50 N inclined at 60° towards West to South and (4) 100 N inclined at 50° towards East to South. Determine the resultant in magnitude and direction analytically.

2 (A) Draw neat-labeled sketch and derive equation of V.R for: "Wheel and Differential axles" **(05)**

(B) In a double purchase crab winch, numbers of teeth on spur wheels are 60 and 40 and numbers 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. **(06)**

3 (A) Find moment of inertia (I_{xx} & I_{yy}) of I section having 70 mm X 5 mm (thick) top flange,80 mm (depth of web) X 6 mm web and 95 mm X 7 mm(thick) bottom flange . **(07)**

3 (B) State and prove" Parallel axis theorem of moment of inertia". **(05)**

OR

3 (A) Explain in Detail: Friction and its types **(05)**

(B) A ladder of length 4m weighing 200N is placed against a vertical wall, which makes an angle of 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. (07)

Section II

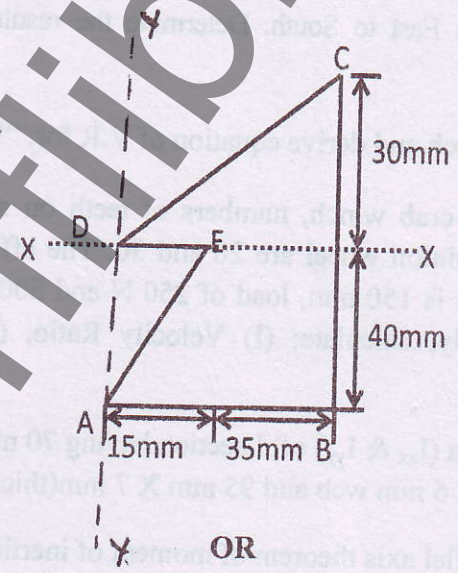
4 **Answer the following question** (12)

(A) Explain with sketches statically Determinate & Indeterminate beams.

(B) Draw shear force and bending moment diagram for simply supported beam. The total length of beam is 10m. Two point loads of 10KN & 12 KN acting downward at 2m and 4m distance from left support. In addition to that 5 KN concentrated load act at mid point in upward direction and uniformly distributed load of 4KN/m acting on 3 meter from right-hand support.

5 (A) State and Explain "Pappus-Guldinus Theorems I & II" (06)

(B) Find out Centroid of the Two Dimensional Object with respect to given XX and YY axes. (06)



OR

5 (A) Define' 'Free Body Diagram' and prove Lami's theorem with its statement. (06)

(B) Derive the equation for the tension in the string, when one is hanging free and the other is lying on a smooth incline plane. (06)

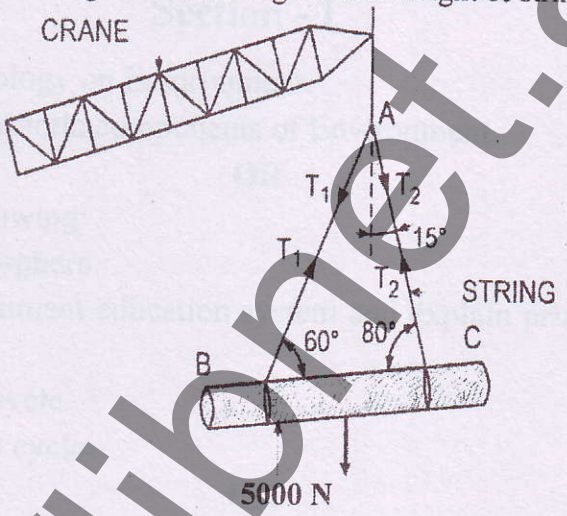
6 (A) Derive equation for volumetric strain of a rectangular bar and circular bar. (06)

(B) The following observations were made during a tensile test on a mild steel specimen having 30mm diameter and 200mm long. Elongation with 40kN load is 0.054 mm, Yield load 100 KN, Maximum load = 140kN and Length of specimen at fracture = 241mm.Determine (1) Young's modulus of elasticity (2) yield stress (3) ultimate stress (4) percentage elongation.(5) Percentage reduction in cross sectional area. **(05)**

OR

6 (A) Explain Newton's Laws of motions. **(06)**

(B) A wooden log is lifted a crane using strings as shown in **figure below.** Find out tension in each string if the weight of log is 5000 N.Neglect self weight of strings **(05)**



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