Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: III (Marine Engineering)

Regular Examination Nov/Dec2013

Subject: 2MR307 Strength of Material

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

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

Section – I

Que. – 1	**A**	Define following terms. (i) Strain Energy (ii) Proof resilience (iii) Proof load (iv) Shear resilience (v) Struts	**5**
	B	Find out the deflection for following condition assume uniform flexural rigidity.	**7**
	i	The center of span l carrying a uniformly distributed load of w per unit run over the whole span.	
	ii	Central Deflection of a simply supported beam carrying a concentrated load at mid-span. at the free end of a cantilever carrying a concentrated load at the free end.	
		OR	
Que. – 1	**A**	Give the expression for the strain energy stored due to axial loading.	**5**
	B	A tensile load of 50 KN is gradually applied to a circular bar of 5 cm diameter and 4 m length. determine (i) stretch in the bar, (ii) stress in the bar, and (iii) strain energy absorbed by the bar.	**7**
Que. – 2	**A**	What is Pure bending. State assumptions made in simple theory of bending. explain the neutral layer and neutral axis. write down only equation and explain each term.	**6**
	B	A built up I section has an overall depth of 450 mm, width of flanges 330mm, thickness of flange 50 mm and web thickness 32 mm. it is used as a beam with simply supported ends and it deflects by 10 mm when subjected to a load of 40 KN/m length. find the safe load if this I section is used as a column with both ends hinged. use Euler's Formula. Assume a factor of safety 1.75 and Take $E=2 \times 10^5$ N/mm^2	**5**
		OR	
Que. – 2	**A**	What is column and short column. Explain and Derive the Rankine's Formula.	**6**
	B	A simply supported beam of 4.8 m span is loaded by uniformly distributed load of 25 KN/m and a central point load of 50 KN. Find the bending stresses on extreme fibres at mid span, if cross section of the beam is a Tee section having overall dimensions 200mm x 200mm x 40mm width flange horizontal. sketch the bending stress distribution. Find also the radius of curvature if modulus of elasticity, E= 100 KN/mm^2.	**5**

Que. – 3 **A** What is stiffness of spring explain their types and derive the equation for closed coil helical springs subjected to an axial looad. **6**

B A hollow propeller shaft having 160 mm external diameter and 80 mm internal diameter transmit 600 h.p. at 80 r.p.m. The shaft is also subjected to B.M. 30 kN.m and axial thrust of 250 KN. Find the principal stresses and principal planes. **6**

Section – II

Que. – 4 **A** What is thick cylinder and derive the Lame's equation for thick cylinder. **6**

B A pipe of 440 mm internal diameter and 140 mm thickness contains a fluid at a pressure 69 N/mm^2. Find the maximum and minimum hoop stresses across the section. Also sketch the redial and hoop stress ditribution across the section. **6**

OR

Que. – 4 **A** What is compound cylinder explain in detail and derive their equation. **6**

B Find the displacement at free end of the cantilever whose left hand fixed and other is free one load point W1 = kN is placed 3 m from fixed end and other W2 = 20 kN/m u.d.l is start from left end up to 2m. length of the beam is 5 m . take E= 2 x 10^5 N/mm^2, I = 2 x 10^8 mm^4. **6**

Que. – 5 **A** Derive the equation for simply supported load with an eccentric point load by double integration method. **5**

B A timber beam of rectangular section has a span of 5 m & is simply supported at its ends. it is required to carry a total load of 50 KN linearly varying load (u.v.l) distributed over the whole span. find the value of the breadth (b) and depth (d) of the beam, if max. bending stress is not to exceed 7 MPa and max. deflection is limited to 10 mm Take E=10.5GPa **6**

OR

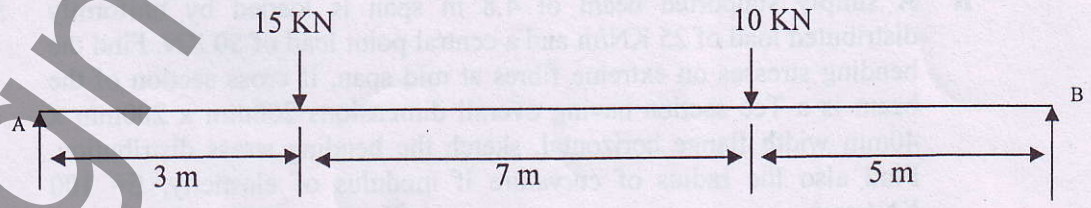
Que. – 5 **A** Derive the equation for a simply supported beam with a eccentric point load by Macaulay's method. **5**

B A horizontal steel girder having uniform C/S is 15 m long and is simply supported at its end . it carries two point load as shown in figure. calculate the deflection of beam under the load C and D. Take E= 200 GPa and I = 160 x 10^6 mm^4. **6**

Que. – 6

A Derive the equation for the stress on an oblique section when a body subjected to direct stress in one plane accompanied by a simple shear. **6**

B At a certain point in a strained material direct stress of 55MPa (Compressive) and 33MPa (tensile) are acting. Find normal, tangential and resultant stress on a plane inclined at 30° to the axis of major stress. **6**



Que 5 B (Fig. 1)

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