S.Y. Diploma : Sem. III
[ME/MH/MI/PG/PT/AE/FE/PS]

Strength of Materials

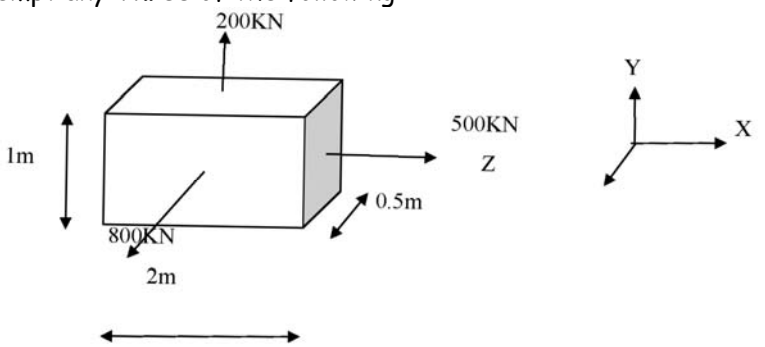
Time: 3 Hrs.] Prelim Question Paper **[Marks : 70**

Instructions :
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Preferably, write the answers in sequential order.

1. Attempt any **FIVE** of the following : **[10]**
(a) State Hook's law.
(b) Define – Bulk modulus.
(c) Define Elasticity, Plasticity and Rigidity.
(d) Define point of contra flexure and point of contra shear.
(e) Draw Kernel of a section along with it's boundaries for a rectangular section of B × D dimensions.
(f) Give the four assumptions in theory of bending.

2. Attempt any **Three** of the following : **[12]**
(a) Draw stress –strain diagram with all important points on it for mild steel and copper materials subjected to gradually applied axial tensile load.
(b) A material has Young's modulus of 125 GPa and Poison's ratio of 0.25. Calculate the modulus of Rigidity and bulk Modulus.
(c) An element of triangular cross section has base of 50mm and height 60mm. Calculate M.I. @ centroidal axis parallel to its base.
(d) Draw S.F. and B.M. diagrams for a simply supported beam of a span 'L' carrying a central point load 'W'. State the values of maximum S.F. and Maximum B.M. and their locations.

3. Attempt any **Three** of the following : **[12]**
(a)



Find linear strains in x, y and z directions of the rectangular block loaded as shown in the figure. Hence using the linear strains values, find the total strain in z direction. Take E = 200GPa. and Poisson's ratio = 0.25

(b) A simply supported beam of 5m span is subjected to UDL of 20 kN/m over 3m length from left support. Draw shear force diagram for the beam.

(c) State parallel axis theorem. Draw related sketch and write mathematical expression.

4. Attempt any **Three** of the following : **[12]**

(a) An overhanging beam has two overhangs, each of 2m on both sides of supports. The distance between supports is 7m and the overall length of the beam is 11m. Two point loads each of 4KN are kept on free ends of the overhangs. Draw shear force and bending moment diagrams. Also find the value of maximum negative bending moment.

(b) Beam ABC is supported at A and B. Portion B.C. is overhang. UDL of 6kN/m is acting over entire length of ABC. AB = 4m and BC = 1m. Taking 'A' as origin write B.M. equation for portion AB and locate the position of point of contraflexure.

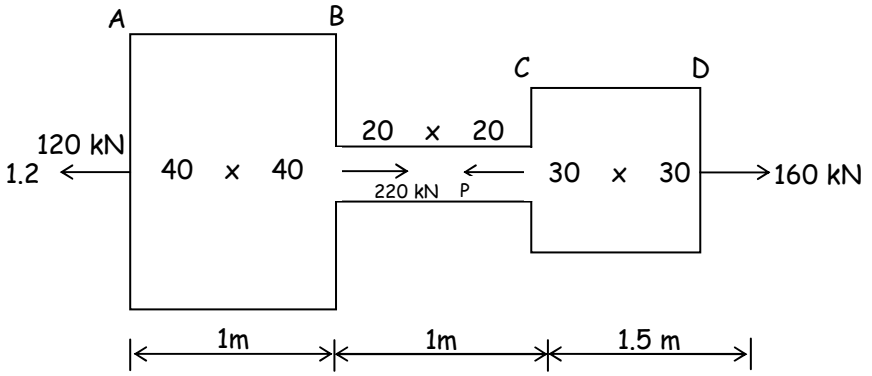
(c) A solid circular shaft is replaced by a hollow circular shaft of same material whose external diameter is twice the internal diameter. Both the shafts are required to transmit same power at same speed. Calculate percentage saving in weight, if both shafts have same strength.

(d) A rod of circular cross section of 50 mm diameter and 3m length is subjected to sudden load of 200KN. Find the maximum instantaneous stress and elongation for the rod. Take E = 200 GPa.

(e) State the assumption in theory of pure torsion.

5. Attempt any **TWO** of the following : **[12]**

(a) A member ABCD is subjected to loads as shown in Fig. Find the force 'P' and net change in length of the member.
Take E= 2×10^5 N/mm^2.



(b) Find the maximum stress in a propeller shaft 400 mm external and 200 mm internal diameter, when subjected to a twisting moment of 4650 Nm. If the modulus of rigidity is 82 GPa. Calculate the twist in a length 20 times the external diameter.

(c) A tie rod of uniform circular cross section is subjected to tensile load of 500 KN at eccentricity of 7.5mm. Find the maximum diameter of the rod if maximum allowable stress is 125MPa.

6. Attempt any **TWO** of the following : **[12]**

(a) A simply supported beam of span 6m is having central point load of 100KN. If the maximum permissible shear stress for the timber materials is 8MPa design the suitable dimensions of the beam, when the section is of (i) Circular cross section (ii) Square cross section.

(b) Find the power that can be transmitted by a shaft of 40 mm diameter rotating at 200 r.p.m., if maximum shear stress is not to exceed 85 MPa.

(c) A square column has co-centric circular cavity of 37.5 mm in diameter. If the maximum load of 220 KN is applied at an eccentricity of 10mm with respect to xx axis and maximum compressive stress is limited to 80 MPa. Find the size of the square column.

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S.Y. Diploma Sem-III: Paper Discussion Schedule

Branches	Date	Day	Timing	Centres
Mechanical Group & Civil Group	8 Nov. 2018	Thursday	9 a.m. to 11 a.m.	Kalyan, Borivali
	8 Nov. 2018	Thursday	12 a.m. to 2 p.m.	Thane
	8 Nov. 2018	Thursday	3 p.m. to 5 p.m.	Dadar