Scheme – I

Sample Question Paper

Program Name : **Mechanical Engineering Program Group**

Program Code : **AE/ME/PG/PT/FG**

Semester : **Third**

22306

Course Title : **Strength of Materials**

Marks : **70** **Time: 3 Hrs.**

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.

Q.1) Attempt any FIVE of the following. **10 Marks**

a) State the formulae to find Moment of Inertias of rectangular ,circular sections @ xx and yy centroidal axes. Draw suitable sketches of the cross sections with xx and yy centroidal axes.

b) Enlist any two machine components subjected to axial tensile stresses and any two machine components subjected to axial compressive stresses.

c) Define Elasticity, Plasticity and Rigidity.

d) Define point of contra flexure and point of contra shear.

e) Draw shear stress distribution diagram for beams of rectangular cross section and symmetrical I section.

f) Draw Kernel of a section along with it's boundaries for a rectangular section of B x D dimensions.

g) Define maximum and minimum resultant stresses in case of direct and bending stresses.

Q.2) Attempt any THREE of the following. **12 Marks**

a) Find Moment of Inertia @ XX and YY centroidal axes of a composite figure consisting of a rectangle of 3m base and 4m height and a isosceles triangle of same base as rectangle and of 6m height ,The triangle is kept on the top of the rectangle.

b) Draw stress –strain diagram with all important points on it for mild steel and copper materials subjected to gradually applied axial tensile load.

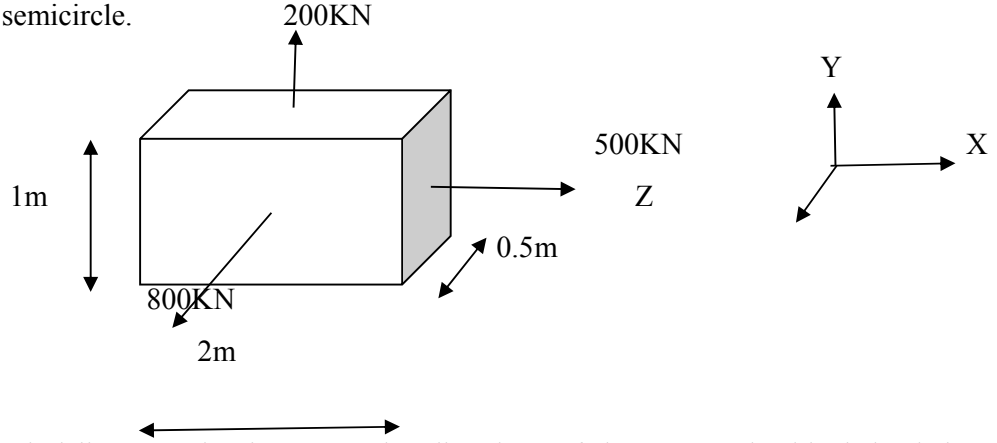
c) A material has Young's modulus of 125 GPa and Poison's ratio of 0.25 . Calculate the modulus of Rigidity and bulk Modulus.

d) Locate the point of maximum BM for a beam simply supported on span of 7m and loaded with udl of 5KN/m for the length of 4m from left hand support.

Q.3) Attempt any THREE of the following. **12 Marks**

a) State parallel axis theorem and use it to find Moment of Inertia of a semi circle of radius " r" about its centroidal xx axis which is parallel to the diameter of the semicircle.

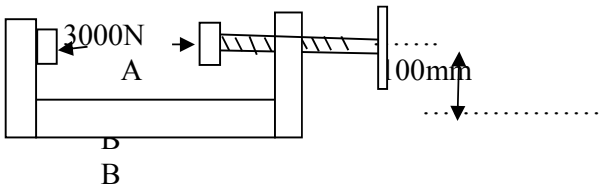
b)



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

c) Draw SFD and BMD locating all important features for a cantilever of 6m length and point loads of 15N at the center of the length of cantilever and 10N at the end of cantilever. There is udl of 5 KN/m. between the two point loads .

d) Find the maximum tensile and compressive stresses on the section AB of a "C clamp" when a compressive force of 3000N is exerted by the clamping screw. The section is rectangular 40mm x 20mm. at AB.



Q.4) Attempt any THREE of the following. **12 Marks**

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.

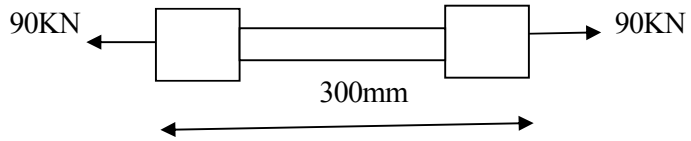
b) A simply supported beam 150mm wide and 300mm deep carries an uniformly distributed load over a span of 4m If the safe stresses are 28 MPa in bending and 2MPa in shear find the maximum uniformly distributed load that can be safely supported by the beam.

c) A solid circular shaft of 100mm diameter transmits 120KW at 200 rpm. Find the maximum shear stress and angle of twist for a length of 6m.Take $G=8x10^4$MPa.

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) A hollow circular shaft of 30mm outside diameter and 20mm inside diameter is subjected to torque of 40N.m. Find the shear stress at outside surface and at inside surface of the shaft.

Q.5) Attempt any TWO of the following. 12 Marks



a) A bar has enlarged ends of square section 60mmx60mm as shown. If the middle portion is also of square section find the size and length of middle portion if the stress there is 150 MPa and the total extension of the bar is 0.15mm .Take E= 200GPa. Overall length of the bar is 300mm. The bar is subjected to axial tensile force of 90KN.

b) A simply supported beam is having span of 6 m. It carries two point loads of 50 KN and 20KN at 1m and 4m from left hand support respectively. Draw bending moment diagram and hence draw the qualitative deflected shape of the beam .

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

Q.6) Attempt any TWO of the following. 12 Marks

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) A solid circular shaft of diameter 200mm has same cross section as that of hollow shaft of same material with inside diameter as 150mm. Find ratio of power transmitted by two shafts at same speed.

c) A square column has co-centric circular cavity of 37.5 mm in diameter. If the maximum load of 220KN 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.

Scheme – I

Sample Test Paper - I

Program Name : **Mechanical Engineering Program Group**

Program Code : **AE/ME/PG/PT/FG**

Semester : **Third**

Course Title : **Strength of Materials**

Marks : **20**

22306

Time: 1 Hour

Instructions:

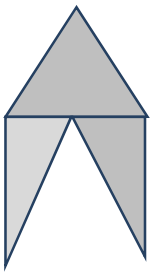
(1) All questions are compulsory.
(2) Illustrate your answers with neat sketches wherever necessary.
(3) Figures to the right indicate full marks.
(4) Assume suitable data if necessary.
(5) Preferably, write the answers in sequential order.

Q.1 Attempt any FOUR. **08 Marks**

a) Define i)Moment of Inertia , ii)radius of gyration
b) Define stress ,strain ,Modulus of elasticity
c) State formulae to find Moment of Inertia of a triangle about axis passing through its i) Base ii) Apex and iii) centroid
d) Define lateral strain, linear strain
e) State the relation between i) modulus of elasticity and modulus of rigidity, ii) modulus of elasticity and Bulk modulus.
f) Define Resilience and Proof Resilience and Modulus of Resilience

Q.2 Attempt any THREE. **12 Marks**

a) Find moment of inertia about an axis parallel to diameter and tangential to the outer circle for hollow circular section having external diameter 300mm and thickness 20mm.
b) Find moment of inertia about centroidal YY axis for the composite figure consisting of Two right angled triangles of height 30mm are attached to the 40mm base of a equilateral triangle .



c) A short C. I. column of height 3m and of hollow circular section having external diameter 300mm and thickness 20mm is subjected to a compressive load of 50 KN within elastic limit . Find the compressive stress .If the contraction due to the load is 5mm. Find the Modulus of elasticity.

d) For a metal bar of 20 mm diameter and 1m long is subjected to an axial pull of 60 KN Take E=1.8x10^5 N/mm^2 and K=1.2x10^5 N/mm^2.Find the change in the diameter of the bar.

e) A rectangular hole of size 10 mm x 15 mm is to be punched through a plate of 5mm. Find the force required to punch the hole if shear stress in the plate material is 300 N/mm^2.

f) In a biaxial stress system the stresses along x direction is 60 N/mm^2 tensile and along y direction 40 N/mm^2compressive .Find the maximum strain. Take E = 200Gpa and poisons ratio =0.25

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Scheme – I

Sample Test Paper - II

Program Name : **Mechanical Engineering Program Group**
Program Code : **AE/ME/PG/PT/FG**
Semester : **Third**
Course Title : **Strength of Materials**
Marks : **20**

22306

Time: 1 Hour

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.

Q.1 Attempt any FOUR. **08 Marks**

a) Define Capacitor.

b) State the term Di-electric strength

c) Draw B-H curve for magnetic curve.

d) State the applications of electromagnet.

e) State Lenz's law.

f) State the different types of inductors

Q.2 Attempt any THREE. **12 Marks**

a) Derive the expression for energy stored in capacitor with the help of neat diagram.

b) Three capacitors having capacitance of 4 μF, 6 μF and 8 μF respectively. Find the equivalent capacitance when they are connected in (i) series (ii) parallel.

c) Explain Hysteresis loop of magnetic material with neat diagram

d) Give any two similarities and dissimilarities between electric and magnetic circuits.

e) State Faraday's first law and second law of Electromagnetic Induction

f) An iron ring with mean circumference of 80 cm and cross sectional area 10 cm^2 is uniformly wound with 500 turns of wire. Determine the current required to set up a flux density of 1.2 Tesla in the ring. Assume $\mu_r = 1000$ for iron.