

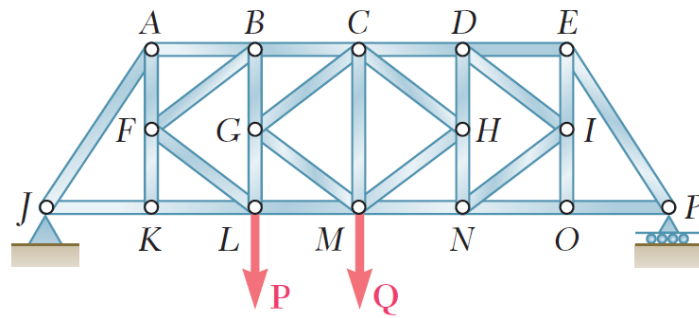
材 料 力 学 考 试 卷

课程名称 _____ 考试学期 _____ 得分 _____
 适用专业 _____ 48 学时 _____ 考试形式 _____ 闭卷 _____ 考试时间长度 120 分钟

一、填空题（共 7 小题，计 20 分）

1、图示桁架在给定荷载作用下的零力杆包括（
 _____）。

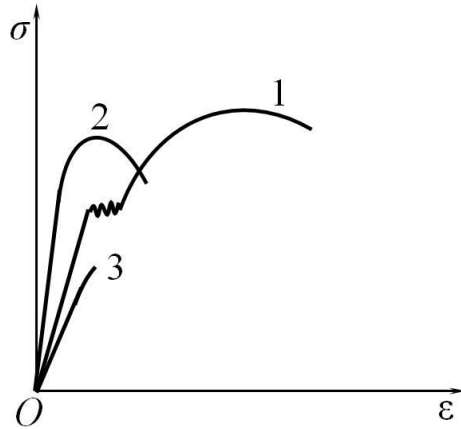
[For the given loading, determine the zero-force members in the truss shown.](3分)



2、材料力学课程所研究的杆件基本受力和变形形式为：（
 _____）、
 （
 _____）、（
 _____）和（
 _____）。[Enumerate the basic forms of deformation studied in mechanics of materials.]（4分）

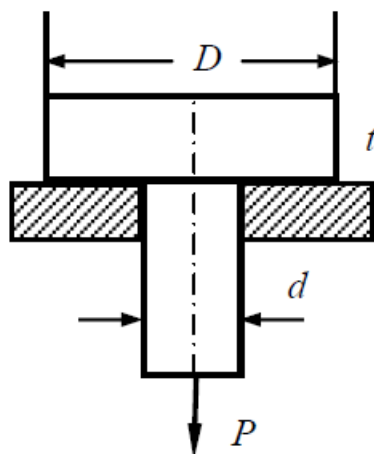
3、三种材料的应力-应变曲线如图所示，从图中可以看出：（
 _____）材料强度高，（
 _____）材料刚度大，（
 _____）材料塑性好。[Based on the stress-strain curves for three material types shown, determine the one representing the highest strength limit, largest stiffness and best plastic performance, respectively.]（3分）

姓名 _____ 线 _____ 封 _____ 密 _____ 号 _____



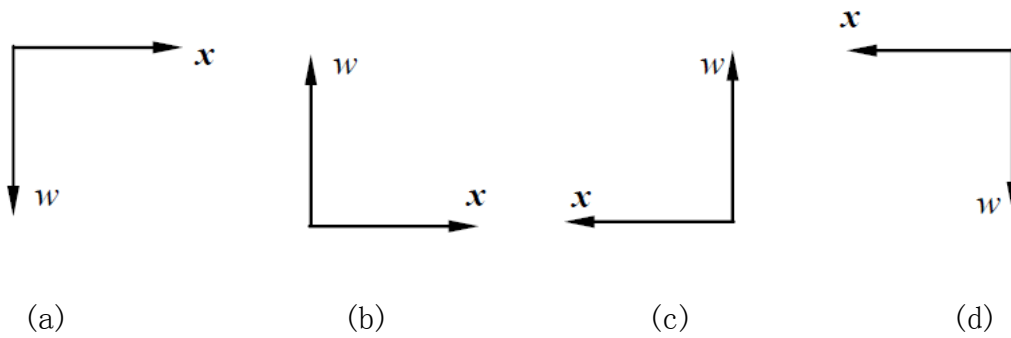
4、图示螺钉在拉力 P 作用下，可能发生剪切和挤压破坏，则螺钉的剪切面面积为（ ），挤压面面积为（ ）。

[Determine the shearing and bearing area of the pin shown.] (2分)



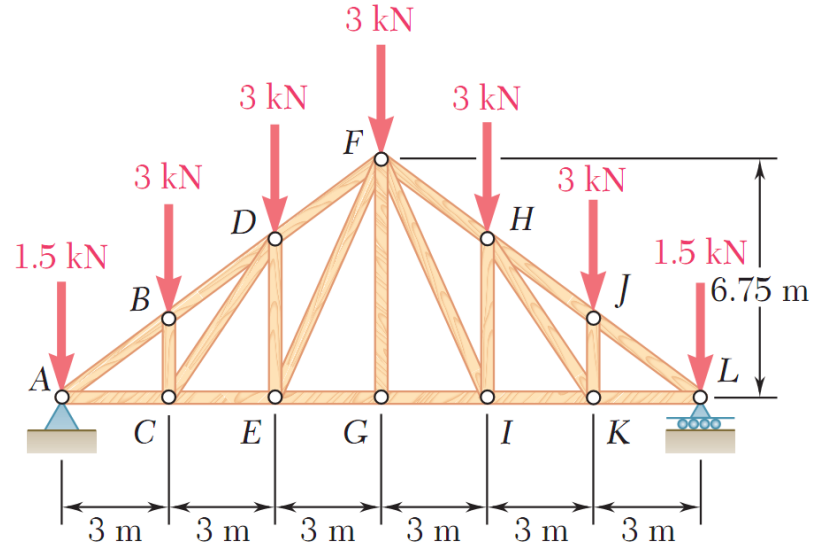
5、若将正方形截面杆的边长增加一倍，则杆的拉伸（压缩）刚度、扭转刚度和弯曲刚度分别变为原来的（ ）、（ ）和（ ）倍？ [How many times will the tension / compression, torsion and bending rigidity of a square cross-sectional bar become, respectively, if its side-length is doubled.](3分)

6、用挠曲线近似微分方程 $EIw'' = M(x)$ 求解挠曲线时，适用的坐标系有哪些？（ ） [Determine the applicable coordinate system(s) of the bending deflection formula: $EIw'' = M(x)$.] (2分)

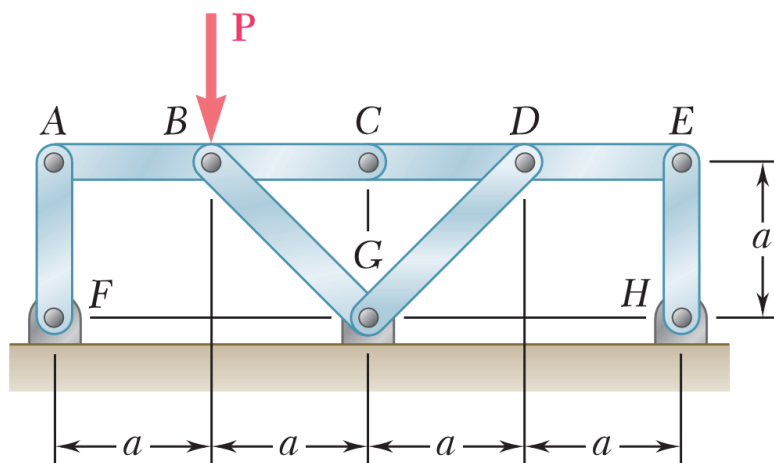


7、矩形截面梁在横力弯曲状态下的弯曲切应力在（ ）位置取最大值，该值为截面平均切应力的（ ）倍。
 [Determine the location of the largest bending shear stress for a rectangular cross-sectional beam under transverse loading. How many times of this stress becomes when compared with the cross-sectional average.] (3 分)

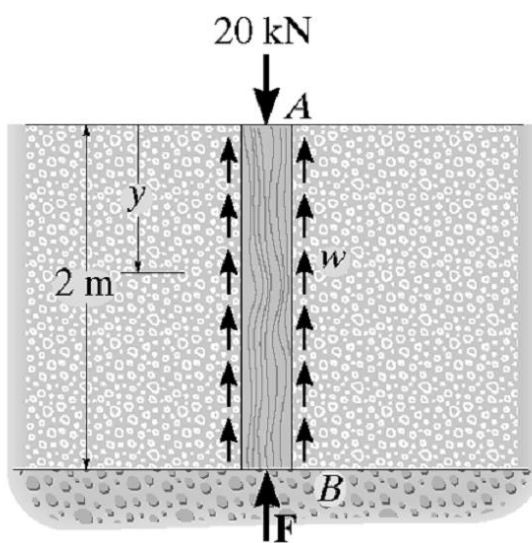
二、试求图示屋顶桁架中杆 FH 、 FI 和 GI 中的内力，并指明是拉伸还是压缩。
 [A Pratt roof truss is loaded as shown. Determine the force in members FH , FI and GI . State whether each member is in tension or compression.] (10 分)



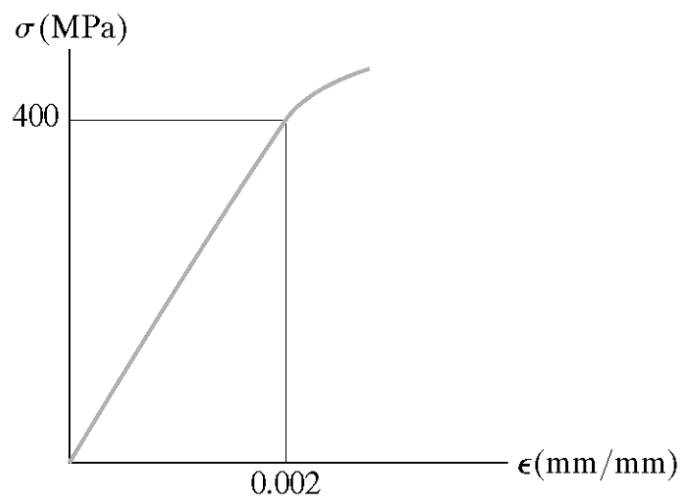
三、如图所示，杆 ABC 和 CDE 在 C 点铰接，并由四根连接杆 AF 、 BG 、 DG 和 EH 支撑，试求图示荷载作用下这四根连接杆内的内力。 [Members ABC and CDE are pin-connected at C and supported by four links AF , BG , DG and EH . For the loading shown, determine the force in each link.] (10 分)



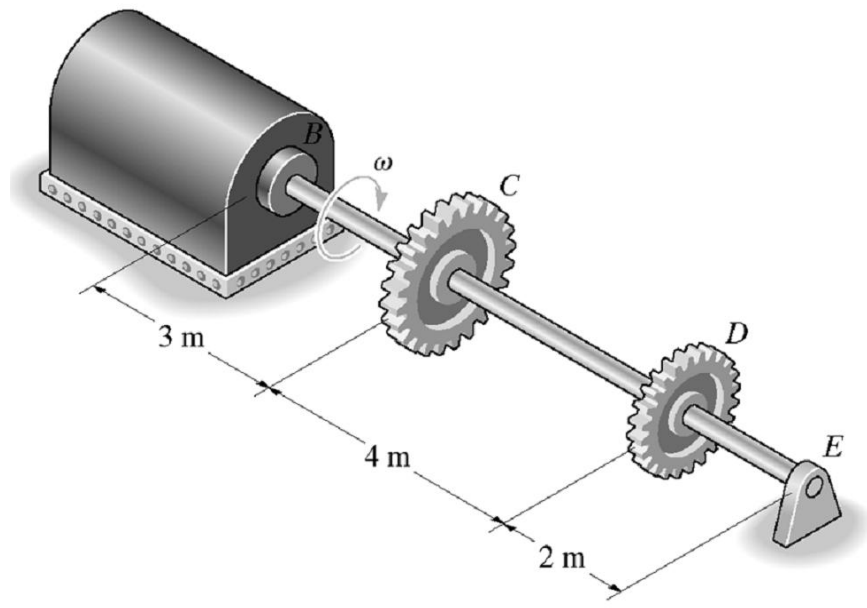
四、图示混凝土柱直径 60 mm，在顶部受到 20 kN 的竖直荷载，柱与土壤之间的摩擦阻力沿柱呈均匀分布： $w = 4 \text{ kN/m}$ ，忽略柱子重量，试求柱底部所受的反作用力 F ，并求柱顶端 A 相对于柱底部 B 的位移。 $E = 13.1 \text{ GPa}$ 。 [The concrete post has a diameter of 60 mm and is subjected to the load of 20 kN. The soil provides a frictional resistance that is uniformly distributed along its sides of $w = 4 \text{ kN/m}$, determine the force F at its bottom needed for equilibrium. Also, what is the displacement of the top of the post with respect to its bottom? Take $E = 13.1 \text{ GPa}$. Neglect the weight of the post.] (10 分)



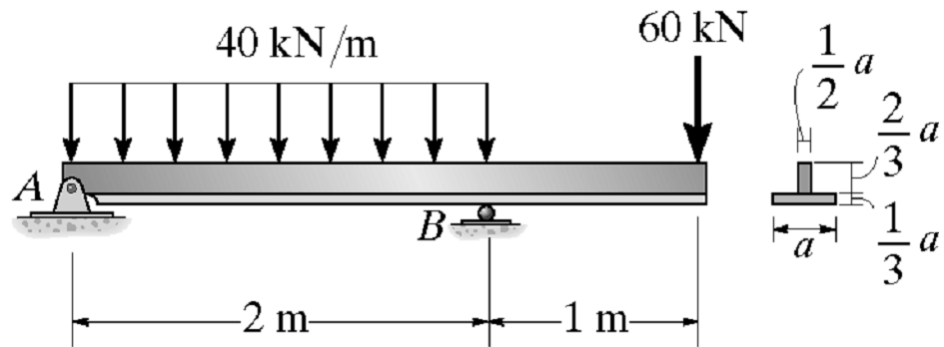
五、一拉伸试件应力应变图的弹性部分如图所示，已知试件测试前直径为 13 mm，标记长度为 50 mm，在线弹性范围内，对应于 50 kN 的拉力测得试件直径为 12.99265 mm，试求试件材料的泊松系数。[The elastic portion of the stress-strain diagram for a steel alloy is shown in the figure. The specimen from which it was obtained had an original diameter of 13 mm and a gauge length of 50 mm. When the applied load on the specimen is 50 kN, the diameter is 12.99265 mm. Determine Poisson's ratio for the material.] (10 分)



六、图示轮机功率为 150 kW，通过直径为 100 mm、转速为 800 rpm 的钢轴向齿轮 *C* 和 *D* 分别传递 70% 和 30% 的能量，试求轴中最大扭转切应力及截面 *E* 相对于截面 *B* 的转角。设钢轴剪切模量为 75 GPa。 [The turbine develops 150 kW of power, which is transmitted to the gears such that *C* receives 70% and *D* receives 30%. If the rotation of the 100-mm-diameter steel shaft is $\omega = 800$ rpm, determine the absolute maximum shear stress developed in the shaft and the angle of twist of end *E* of the shaft relative to *B*. The shear modulus $G = 75$ GPa.] (12 分)



七、试求图示 T 形梁的剪力图、弯矩图和最小所需截面尺寸 a 。设梁的许用弯曲正应力为 150 MPa。[The beam is subjected to the loading shown. Determine the diagrams of shearing forces and bending moments, and the minimum required cross-sectional dimension a , if the allowable bending stress for the material is 150 MPa.] (13 分)



八、试求图示外伸梁截面 C 的挠度及截面 B 的转角, 设 EI 为常数。[For the beam and loading shown, determine the deflection at section C and the slope at section B . EI is constant.] (15 分)

