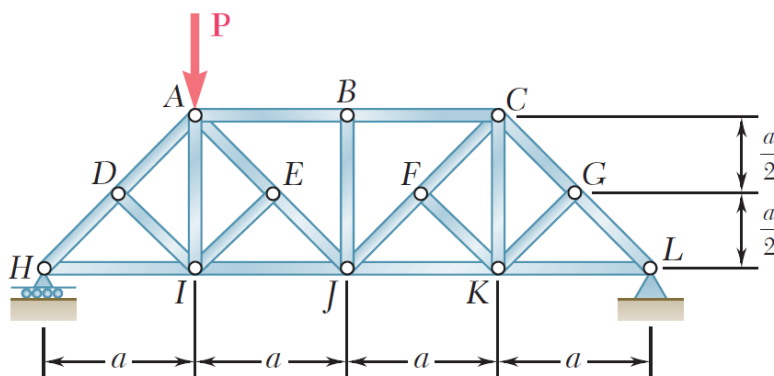课 程 名 称 _____ 考试学期 _____ 得分 _____

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、材料力学对杆件的受力和变形进行研究时所作的基本假设有

（　　　　　　　　）、（　　　　　　　　）、（　　　　　　　　）和

（　　　　　　　　）。[Enumerate the basic hypotheses assumed in the study of

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

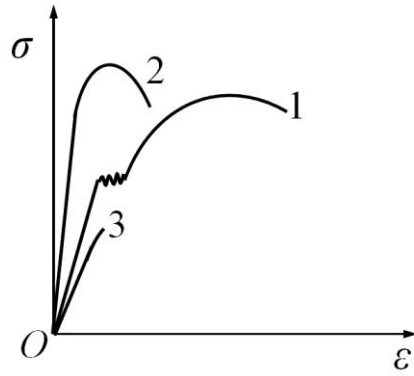the highest strength limit, largest stiffness and best plastic performance,
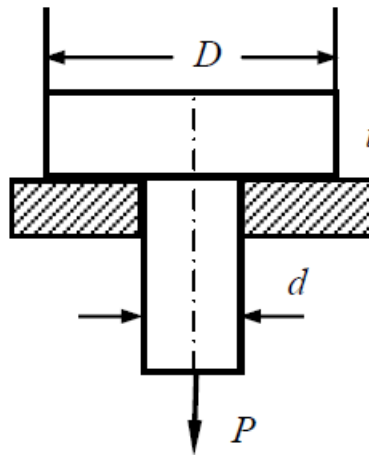
respectively.]（3 分）

4、图示销钉受轴向拉力 P 作用，则销钉内的剪切应力等于（　　　　　　），支承面上的挤压应力为（　　　　　　）。[Determine the shearing and bearing stress developed in the pin shown.]（2 分）

5、若将圆形截面杆的直径增加一倍，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 circular cross-sectional bar become, respectively, if its diameter 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）

(a)   (b)   (c)   (d)
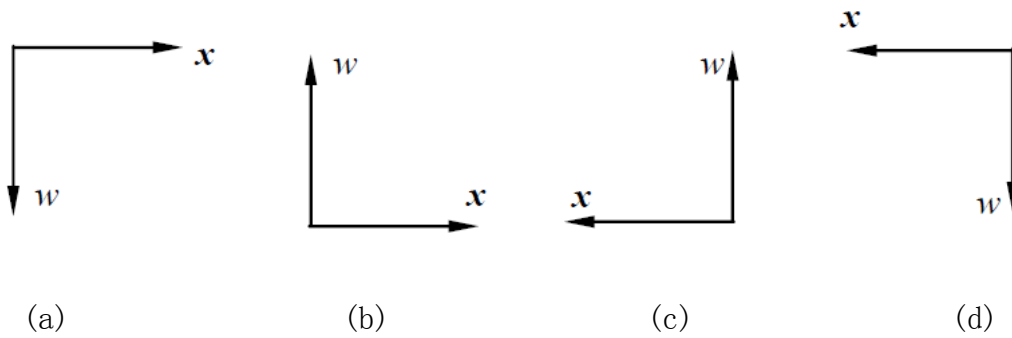
7、圆形截面梁在横力弯曲状态下的弯曲切应力在（   ）位置取最大值，该值为截面平均切应力的（   ）倍。

[Determine the location of the largest bending shear stress for a circular 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 *CE*、*DE* 和 *DF* 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 *CE*, *DE* and *DF*. State whether each member is in tension or compression.]（10 分）
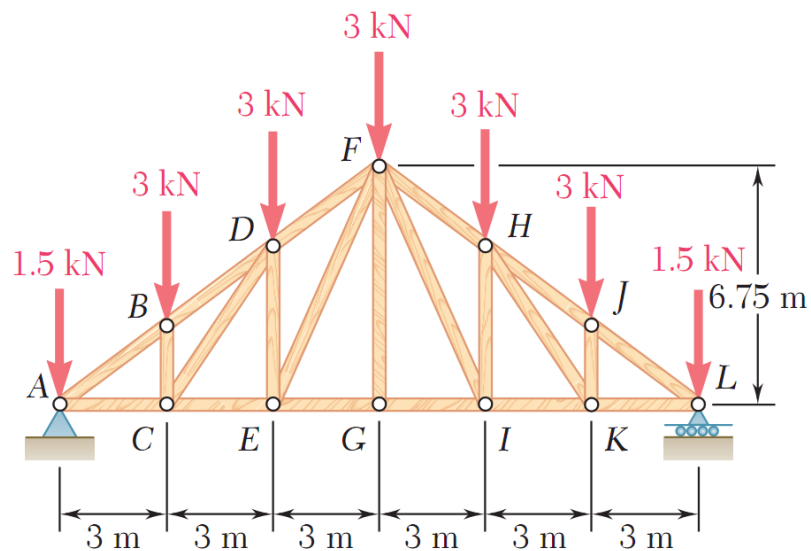
三、如图所示，杆 *ABC* 和 *CDE* 在 *C* 点铰接，并由四根连接杆 *AG*、*BF*、*DI* 和 *EH* 支撑，试求图示荷载作用下这四根连接杆内的内力。 [Members *ABC* and *CDE* are pin-connected at *C* and supported by four links *AG*, *BF*, *DI* and *EH*. For the loading shown, determine the force in each link.]（10 分）
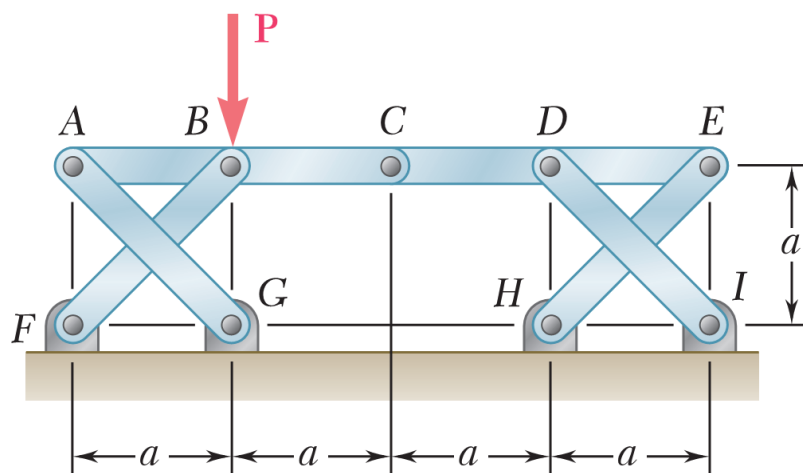
四、聚酯树脂的拉压应力应变曲线如右图所示，左图中的刚性杆 AC 由该材料制成的杆 AB（直径 40 mm）和 CD（直径 80 mm）共同支撑，试求当 P = 80 kN 时刚性杆 AC 的倾斜角。[The stress-stain diagram for a polyester resin is given in the figure. If the rigid beam AC is supported by a strut AB and post CD made from this material, determine the angle of tilt of the beam when P = 80 kN. The diameter of the strut is 40 mm and the diameter of the post is 80 mm.]（10 分）
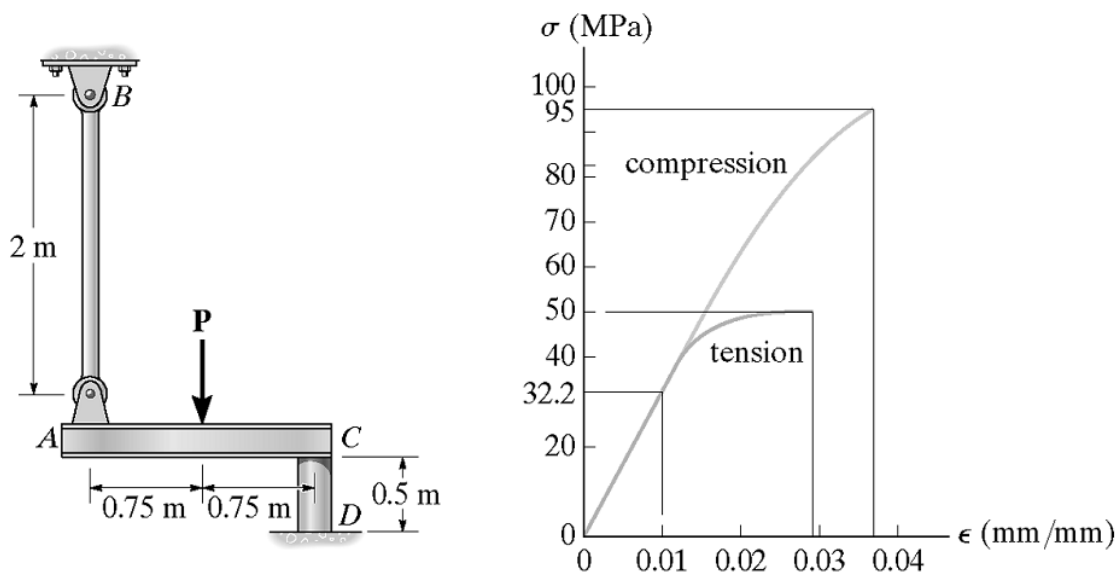
五、一拉伸试件应力应变图的弹性部分如下图所示，已知试件测试前直径为 13 mm，标记长度为 50 mm，试求当轴向拉力 $P = 20$ kN 时杆件的直径和标记长度，设试件材料的泊松系数为 0.4。[The elastic portion of the stress-strain diagram for a steel alloy is shown in the figure. The specimen from which it was obtained had an original diameter of 13 mm and a gauge length of 50 mm. If a load of $P = 20$ kN is applied to the specimen, determine its diameter and gauge length. Take Poisson's ratio as 0.4.]（10 分）

σ(MPa)

400

0.002

ϵ(mm/mm)
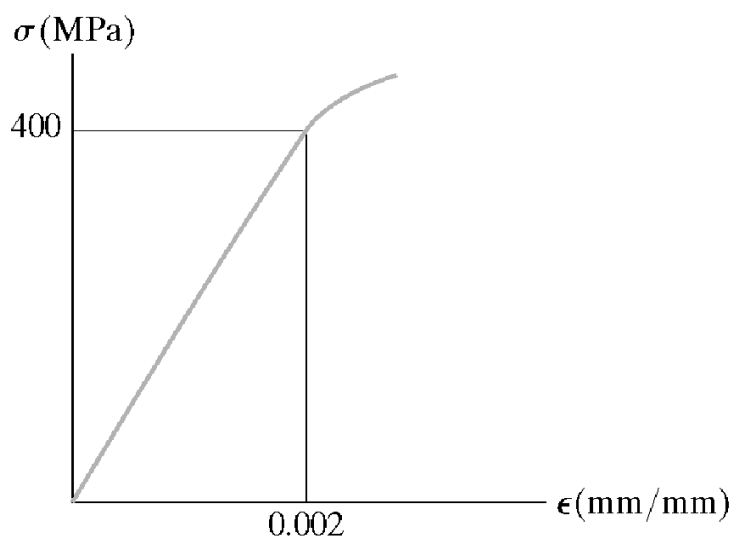
六、图示钢轴直径 50 mm，试求轴中最大扭转切应力，并作图表示扭转角随截面位置的变化函数关系。设钢轴剪切模量为 75 GPa。[The steel shaft has a diameter of 50 mm and is subjected to the distributed and concentrated loadings shown. Determine the absolute maximum shear stress in the shaft and plot a graph of the angle of twist of the shaft versus x. The shear modulus $G = 75$ GPa.]（12 分）
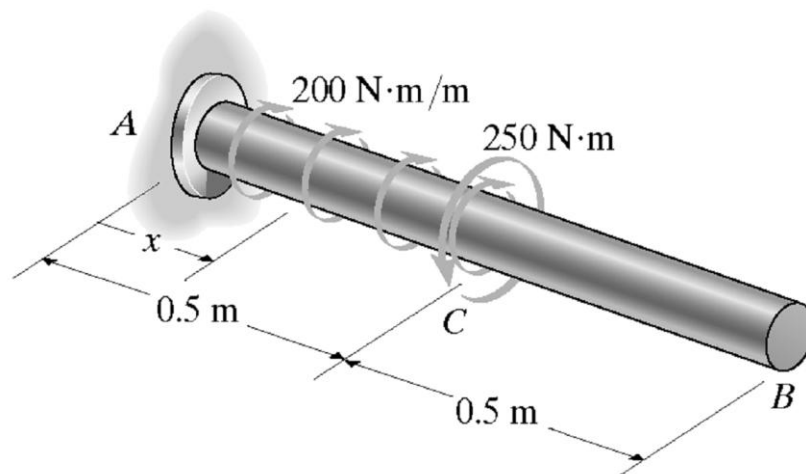
七、试求图示 T 形梁的剪力图、弯矩图和最大弯曲正应力。设截面尺寸 $a = 180$ mm。
[The beam is subjected to the loading shown. If its cross-sectional dimension $a = 180$ mm, determine the diagrams of shearing forces and bending moments, and the absolute maximum bending normal stress developed in the beam.]（13 分）

40 kN/m

60 kN

$\frac{1}{2}a$

$\frac{2}{3}a$

A

B

a

$\frac{1}{3}a$

—2 m— —1 m—
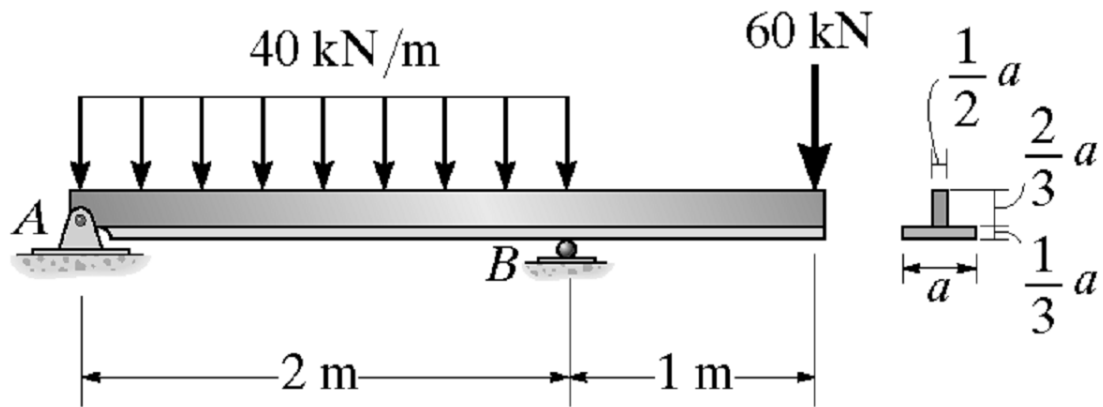
八、试求图示外伸梁截面 *D* 的挠度和截面 *A* 的转角, 设 *EI* 为常数。[For the beam and loading shown, determine the deflection at section *D* and the slope at section *A*. *EI* is constant.]（15 分）