UNIVERSITY OF ARKANSAS

MEEG 3013 **Name:** ______________________________

(Underline your **last name**.)

Final Exam ( ) **ID#:** ______________________________

Circle the correct or nearest item in each of the following: (10% each)

1. A state of stress at a point is obtained by the superposition of two states of stress at the same point as shown. The value of σ_x is

(a) 4 ksi. (b) −4 ksi. (c) 6 ksi. (d) −6 ksi. (e) 8 ksi. (f) −8 ksi. (g) 10 ksi. (h) −10 ksi. (i) 0.

2. A state of stress at a point is obtained by the superposition of two states of stress at the same point as shown. The value of σ_y is

(a) 4 ksi. (b) −4 ksi. (c) 6 ksi. (d) −6 ksi. (e) 8 ksi. (f) −8 ksi. (g) 10 ksi. (h) −10 ksi. (i) 0.

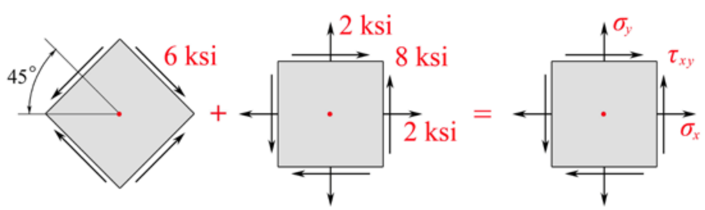

Fig. P1 and P2

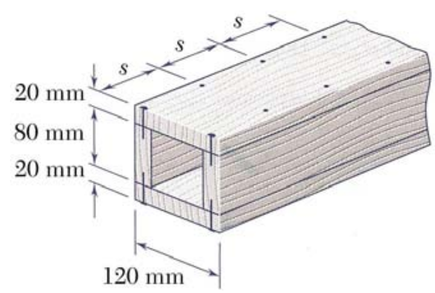

Fig. P3 and P4

3. A square box beam is made of two 20×80-mm planks and two 20×120-mm planks nailed together as shown, where $s = 50$ mm and that the allowable shearing force in each nail is 450 N. The largest allowable vertical shear V in the beam is

(a) 3.24 kN. (b) 3.00 kN. (c) 2.77 kN. (d) 2.54 kN. (e) 2.31 kN. (f) 2.08 kN. (g) 1.849 kN.

4. A square box beam is made of two 20×80-mm planks and two 20×120-mm planks nailed together as shown, where $s = 50$ mm and that the allowable shearing force in each nail is 450 N. The corresponding maximum vertical shearing stress τ_{max} in the beam is

(a) 443 kPa. (b) 507 kPa. (c) 570 kPa. (d) 633 kPa. (e) 697 kPa. (f) 760 kPa. (g) 823 kPa.

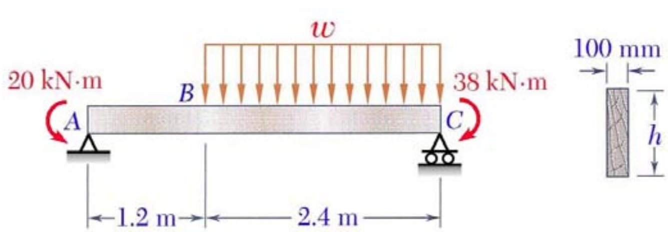

Fig. P5

5. A timber beam is supported and loaded as shown, where w = 76 kN/m, the allowable bending stress is 12 MPa, and the side view of the cross section of the beam is as depicted. The required minimum value of the depth h of the beam is

(a) 429 mm. (b) 458 mm. (c) 485 mm. (d) 510 mm. (e) 535 mm. (f) 558 mm. (g) 581 mm.

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6. The beam shown has a constant flexural rigidity *EI*. The reaction force at support *A* is

(a) $\frac{15M_0}{24L}\uparrow$. (b) $\frac{15M_0}{24L}\downarrow$. (c) $\frac{13M_0}{24L}\uparrow$. (d) $\frac{13M_0}{24L}\downarrow$. (e) $\frac{7M_0}{24L}\downarrow$. (f) $\frac{2M_0}{24L}\uparrow$. (g) $\frac{2M_0}{24L}\downarrow$.

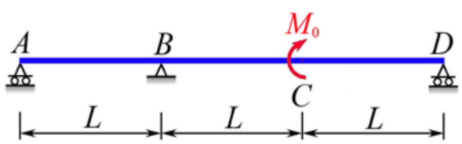

Fig. P6 and P7

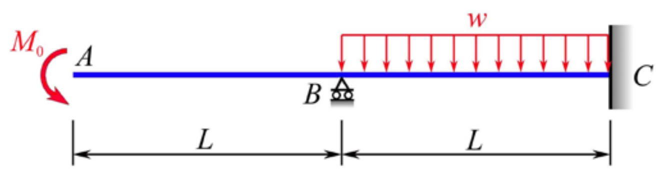

Fig. P8, P9, and P10

7. The beam shown has a constant flexural rigidity *EI*. The reaction force at support *B* is

(a) $\frac{15M_0}{24L}\uparrow$. (b) $\frac{15M_0}{24L}\downarrow$. (c) $\frac{13M_0}{24L}\uparrow$. (d) $\frac{13M_0}{24L}\downarrow$. (e) $\frac{7M_0}{24L}\downarrow$. (f) $\frac{2M_0}{24L}\uparrow$. (g) $\frac{2M_0}{24L}\downarrow$.

8. The beam *ABC* of length 2*L* has a constant flexural rigidity *EI* and carries a moment $\mathbf{M}_0$ at *A* and a distributed load with intensity *w* in the segment *BC* as shown, where $\mathbf{M}_0 = 4wL^2$ ↺**.** The reaction at *B* of the beam is

(a) $\frac{51wL}{8}\uparrow$. (b) $\frac{57wL}{8}\uparrow$. (c) $\frac{63wL}{8}\uparrow$. (d) $\frac{69wL}{8}\uparrow$. (e) $\frac{75wL}{8}\uparrow$. (f) $\frac{81wL}{8}\uparrow$. (g) $\frac{87wL}{8}\uparrow$.

9. The beam *ABC* of length 2*L* has a constant flexural rigidity *EI* and carries a moment $\mathbf{M}_0$ at *A* and a distributed load with intensity *w* in the segment *BC* as shown, where $\mathbf{M}_0 = 4wL^2$ ↺**.** The deflection at *A* of the beam is

(a) $-\frac{125wL^4}{48EI}$. (b) $-\frac{143wL^4}{48EI}$. (c) $-\frac{161wL^4}{48EI}$. (d) $-\frac{179wL^4}{48EI}$. (e) $-\frac{197wL^4}{48EI}$. (f) $-\frac{215wL^4}{48EI}$.
(g) $-\frac{233wL^4}{48EI}$. (h) $-\frac{251wL^4}{48EI}$.

10. The beam *ABC* of length 2*L* has a constant flexural rigidity *EI* and carries a moment $\mathbf{M}_0$ at *A* and a distributed load with intensity *w* in the segment *BC* as shown, where $\mathbf{M}_0 = 4wL^2$ ↺**.** The slope at *A* of the beam is

(a) $\frac{419wL^3}{48EI}$. (b) $\frac{389wL^3}{48EI}$. (c) $\frac{359wL^3}{48EI}$. (d) $\frac{329wL^3}{48EI}$. (e) $\frac{299wL^3}{48EI}$. (f) $\frac{269wL^3}{48EI}$. (g) $\frac{239wL^3}{48EI}$.