**Questions Bank**

Q.1:

 Force **F** acts on the frame such that its component acting along member *AB* is 650 lb, directed from *B* towards *A*, and the component acting along member *BC* is 500 lb, directed from *B* towards *C*. Determine the magnitude of **F** and its direction***θ***. Set f***φ*** = 60.

 

Q.2:

Replace the distributed loading by an equivalent resultant force and specify where its line of action intersects member *BC*, measured from *C*.

 

200N/m

200N/m

100N/m

Q.3:Determine the tension in the cable at *B*, given that the uniform cylinder mass 150 kg. Neglect friction and the weight of bar *AB*. 

Q.4 :-

 Determine the force in member *BE* of the loaded truss.

 

Q.5:Determine the orientation of the principal axes of inertia through the centroid (parallel to the x and y axes) of the angle section and determine the corresponding maximum and minimum moments of inertia, using Mohr's circle.

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Q.6

 The two homogeneous bars *AB* and *BC* are connected with a pin at *B* and placed between rough vertical walls. If the coefficient of static friction between each bar and the wall is 0.4, determine the largest angle *θ* for which the assembly will remain at rest.

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Q.7:

Determine the forces in members *BF*, *EF* and *BC*. Indicate tension or compression.

 

Q.8

 Determine the orientation of the principal axes of inertia through the centroid (parallel to the x and y axes) of the angle section and determine the corresponding maximum and minimum moments of inertia, using Mohr's circle.

 

Q.9:

 The line of action of the 3000-lb force runs through the points *A* and *B* as shown in the figure. Determine the *x* and *y* scalar components of **F**.



Q.10:

The force **R** is the resultant of the forces **P**1, **P**2, and **P**3 acting on the rectangular plate. Find *P*1 and *P*2 if *R* =40 kN and *P*3 =20 kN.

 

Q.11:

The spring has a stiffness of *k* = 800 N/m and an unstretched length of 200 mm. Determine the force in cables *BC* and *BD* when the spring is held in the position shown. **(Equilibrium of a particle)**

 

Q.12 :

 Determine the resultant **R** of the three forces acting on the simple truss. Specify the points on the *x*- and *y*-axes through which **R** must pass.



Q.13:

 Determine the magnitude of the pin reaction at *A*, assuming the weight of bar *ABC* to be negligible.



 Q.15:

Calculate the forces in members *AB*, *BG*, and *GF*. Solve for each force from an equilibrium equation which contains that force as the only unknown.

 

Q.16:

Determine the components of reaction at *E* .

 

Q.17:

 Determine the principal moments of inertia and principal axes of the Z-section about its centroidal *x*0 - and *y*0 -axes. Using Mohr's circle.

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Q. 18:-

 A stepladder consisting of two legs pinned together at *C* is resting on a rough floor. Will a 800N worker be able to change the light bulb if he is required to climb to a height of 1.3 m? The uniform legs *AC* and *BC* weigh 110 N and 70 N, respectively. The coefficient of static friction at *A* and *B* is 0.48.

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Q.19:

The two bars, pinned together at *B*, are supported by a frictionless surface at *A* and a built-in support at *C*. Determine the internal force systems acting on sections 1 and 2.

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Q.20:

The crate has a mass of 80 kg and is being towed by a chain which is always directed at 20° from the horizontal as shown. Determine the crate’s acceleration in t = 2 s if the coefficient of static friction is μs = 0.4 the coefficient of kinetic friction is μk = 0.3 and the towing force is P = (90t2) N, where t is in seconds.

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**p**

Q.21:

 Find the forces in members BC, BE and DE.



**6.5kN**

Q.22:

Determine the magnitudes of the pin reactions at *A, B and C*, and support reactions. Neglect the weight of the frame.

 

**500N.m**

**3m**

**3m**

**1.5m**

**D**

**B**

**A**

**C**

**E**

Q.23:

Determine the principal moments of inertia at point O and its orientation of the principal axes with respect to x, y axes using Moher’s circle.

 

Q.24 :-

 The 60-kg crate has its center of gravity at *G*. Determine the smallest force *P* that will initiate motion (slipping or tipping) if *θ* =30◦.

**1m**



**0.4m**

**1.2m**

Q.25:

 Determine the internal normal force, shear force, and moment acting at point *C* and at point *D*, which is located just to the right of the roller support at *B*.

**450N/m**



**1.5m**

**1.5m**

**1.5m**

**1.5m**

**300N/m**

**300N/m**

 **Q26\:** Determine the magnitude of the resultant force **FR = F1 + F2 (vector addition)** asshown in **fig.1,** and its direction measured counterclockwise from the positive *u* axis.

**Given:**

***F1* = 250 N, *F2* = 500 N, θ*1* = 30 deg, θ*2* = 30 deg, θ*3* = 45 deg**

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**Q27\:** Express each of the three forces acting on the column as shown in **fig.2,** in Cartesian vector form and compute the magnitude of the resultant force.

**Given:**

***F1* = 150 kN, *F2* = 275 kN, *F3* = 75 kN, θ = 60 deg, *c* = 4, *d* = 3**

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**Q28\:** Determine the force in each cable and the force **F** as shown in **fig.3** needed to hold the lamp of mass *M* in the position shown.

**Given:**

***M* = 4 kg, θ*1* = 30 deg, θ*2* = 60 deg, θ*3* = 30 deg**

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**Q29\:** Replace the loading on the frame shown in **fig.4** by a single resultant force. Specify where its line of action intersects member *AB*, measured from *A and B* . **(30 M)**

**Given:**

***F1* = 300 lb, *F2* = 200, *F3* = 400 lb, *F4* = 200 lb*, a* = 3 ft, *b* = 4 ft, *c* = 2 ft, *d* = 7 ft**

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**Fig 1**

**Fig 2**





**Fig 4**

**Fig 3**

**Q30\:** Replace the loading system acting on the beam shown in **fig.1** by an equivalent resultant force and couple moment at point *O*.

***F1* = 200 N, *F2* = 450 N, *M* = 200 N⋅m, *a* = 0.2 m, *b* = 1.5 m, *c* = 2 m, *d* = 1.5 m, θ = 30 deg**

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**Q31\:** Determine the reactions at the smooth contact points A, B, and C on the bar shown in **fig.2**.

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**Q32\:** Determine the force in each member of the loaded truss (*W=200 kg*) shown in **fig.3**

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**Q33\:** Neglect the weight of the frame shown in **fig.4** and compute the forces acting on all of its members.

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**Fig 2**

**Fig 1**





**Fig 3**

**Fig 4**

**Q34\:** The 30-N force P is applied perpendicular to the portion BC of the bent bar as shown in **fig.1**.. Determine the moment of P about point B and about point A.

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**Q35\:** Compute the reactions at the supports A and B of the beam shown in **fig.2**.

W1= 800N/m, W2= 200 N/m, a = 2 m, b = 3 m

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**Q36\:** Determine the forces in members AB, BG, and GF of the loaded truss.as shown in **fig.3**

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**Q37\:** Neglect the weight of the frame shown in **fig.4** and compute the forces acting on all of its members.

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A

B

**Fig 2**

b

a

W1

W2



**Fig 1**



**Fig 4**

**Fig 3**

**Q38\:** Determine the components of the 800-lb force **F** asshown in **fig.1**. along the oblique axes *a* and *b.* Also, determine the projections of **F** onto the *a*- and *b*-axes

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**Q39\:** The two forces shown act at point *A* of the bent bar as shown in **fig.2**. Determine the resultant **R** of the two forces.

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**Q40\:** Determine the maximum weight *W* of the block that can be suspended in the position shown in **fig.3**. if each cord can support a maximum tension *T*. Also, what is the angle θ for equilibrium?

**Given: *T* = 80 lb, *ϕ* = 30 deg.**

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**Q41\:** Replace the two forces acting on the bent pipe as shown in **fig.2** by a single equivalent force **R**. Specify the distance *y* from point *A* to the line of action of **R**.

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**Q42\:** The 500-kg uniform beam is subjected to the three external loads shown in **fig.5**. Compute the reactions at the support point *O*.

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**Fig 1**







**Fig 2**

**Fig 3**



**Fig 4**



**Fig 5**

**Q43\:** Determine the forces in members *AB*, *BG*, CD, DE and *GF* of the loaded truss shown in **fig.**1

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**Q44\:** Determine the magnitude of the pin reaction at *B* of the loaded frame shown in **fig.2** by:

1. Ignoring the fact that *BD* is a two-force member.
2. Recognizing the fact that BD is a two-force.

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**Q45\:** Determine the angle α which locates the principal axes of inertia through point *O* for the rectangular area shown in **fig.3**. Construct the Mohr’s circle of inertia and specify the corresponding values of Imax and Imin.

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**Fig 3**

**Fig 1**





**Fig 2**

