

B.Sc. PROSTHETICS AND ORTHOTICS
FIRST YEAR
PAPER IV – APPLIED MECHANICS AND STRENGTH OF MATERIALS

Q.P. Code: 802404

Time: Three hours

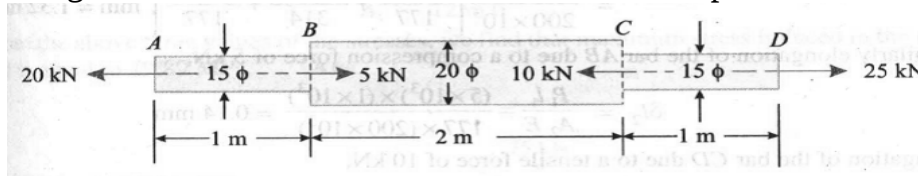
Maximum : 100 Marks

Answer All questions

I. Elaborate on:

(3 x 10 = 30)

1. A Steel bar ABCD 4m long is subjected to forces as shown in the fig. Find the elongation of the bar. Take E for the steel as 200 Gpa.



2. Find the centre of gravity of a channel section 100mm x 50mm is 15mm thick.
3. Discuss about the control system and its application in Prosthetics & Orthotics.

II. Write notes on:

(8 x 5 = 40)

1. What is Mechanics, Statics, Dynamics, Kinematics and Kinetics?
2. State parallelogram and triangle law of forces.
3. Write the different types of stresses with diagram.
4. Define the term 'Factor of safety' and state its significance.
5. Discuss about the different types of loads.
6. State Theorem of Parallel Axis.
7. Difference between Open and Closed Helical Springs with diagrams.
8. Define Ergonomics with relevant example.

III. Short answers on:

(10 x 3 = 30)

1. What is Scalar & Vector Quantity?
2. What is Derived Units?
3. What is meant by resultant of force?
4. Define Stress & Strain.
5. Define Poisson's Ratio.
6. What is Cantilever beam?
7. What is Centre of Gravity?
8. What is Moment of Inertia?
9. What is Stiffness of the spring?
10. What is meant by Torque?

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Answer All questions

I. Elaborate on:**(3 x 10 = 30)**

1. A mild steel rod of 20mm diameter and 300mm long is enclosed centrally inside a hollow copper tube of external diameter 30 mm and internal diameter 25 mm. The ends of the rod and tube are brazed together and the composite bar is subjected to an axial pull of 40 kN. If E for the steel and copper is 200 GPa and 100 GPa respectively find the stresses developed in the rod and tube. Also find extension of steel rod.
2. Explain about torsion. Derive an expression for torsional stress and strain.
3. A cantilever beam AB 1.8 meter long carries a point load 2.5 kN at its free end and uniformly distributed load of 1kN/m from A to B. Draw the shear force and bending moment diagram for the beam.

II. Write notes on:**(8 x 5 = 40)**

1. Equilibrium and its equation.
2. Two like parallel forces 50N and 100N act at the ends of a rod 360mm. Find the resultant force and the point at which it acts.
3. Find the CG of T section 100mm x 150mm x 30mm T section.
4. Define force and its effects. Find the force which can give a body of mass 100 kg accelerated at 3.5 m/sec^2 .
5. Polar moment of inertia.
6. Water pollution and its causes and preventive measures.
7. Control system in prosthetics with example.
8. Elastic limit and Hooke's law.

III. Short answers on:**(10 x 3 = 30)**

1. What do you understand by ultimate stress?
2. Find the unit vector of $3\mathbf{i} + 4\mathbf{j}$.
3. State Newton's second law.
4. What is volumetric Strain?
5. Explain about deflection of beam.
6. Write briefly on close loop and open loop in control system.
7. Tensile and compressive stress.
8. Angular velocity.
9. Conservation of Energy.
10. Man machine interaction.

BACHELOR IN PROSTHETICS AND ORTHOTICS
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Answer All questions

I. Elaborate on: **(3 x 10 = 30)**

1. State Hook's Law. Explain stress and strain diagram for tension.
2. A simply supported beam of 3 meter span carries two loads of 5 kN each at 1 meter and 2 meter from left hand support. Draw shear force and bending moment diagram for beam.
3. Explain about moment and moment of inertia. Find the moment of inertia of a rectangular section 30 mm wide and 40 mm deep about X-X axis and Y-Y axis.

II. Write notes on: **(8 x 5 = 40)**

1. State parallelogram law of forces. Find the resultant of two forces equals to 50N and 100N acting at an angle 30° .
2. What is centre of gravity? Find CG of a I section top flange 100x20 mm web is 200x30mm and bottom flange is 300x40 mm.
3. Angle of friction and co efficient of friction.
4. Ergonomics and its laws.
5. Air pollution and its causes and preventive measure
6. Work and power.
7. A steel rod 1 met long 20mmx20 mm cross section is subjected to tensile force 40kN. Determine elongation of rod if modulus of elasticity 200Gpa.
8. Section modulus.

III. Short answers on: **(10 x 3 = 30)**

1. Define factor of safety.
2. Differentiate between scalar and vector quantity.
3. Represent vector AB if A and B coordinates are (0,-3) and (2,4) respectively.
4. What is inertia of rest? Give example.
5. Define shear force and bending moment.
6. What is stiffness of a spring?
7. Differentiate between open loop and close loop control system.
8. What you understand by Bio cybernetics?
9. Write down three factors responsible for noise pollution.
10. Define Poisson's ratio.
