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Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1.   **Attempt any <u>FIVE</u> of the following:**   **10**

a) State equation of torque required to raise the load and torque required to lower the load in power screw.

b) State types of shafts.

c) State names of any four theories of elastic failure.

d) Classify bearing.

e) State different types of levers used in various engineering applications.

f) State different properties of shaft material.

g) Define linear and lateral strain.

Marks

2. Attempt any THREE of the following: 　12

a) Explain any four aesthetic considerations in design by giving suitable example.

b) State any four advantage and disadvantage of riveted joint.

c) State any four types of springs with one application of each.

d) List important physical characteristics of good bearing material.

3. Attempt any THREE of the following: 　12

a) State assumption in the theory of simple bending.

b) State torsional formula & explain the meaning of each term.

c) Write design procedure for turn buckle.

d) Find the required diameter of steel rod that has to carry an axial pull of 40 kN, if the permissible-stress is 150 MPa.

e) Write equation with Wahl's factor, used for design of helical coil spring. State the SI unit of each term in the equation.

4. Attempt any THREE of the following: 　12

a) A cylindrical pipe of external dimeter 100 mm and thickness 20 mm is subjected to an axial pull of 80 kN, calculate stress induced in the shaft.

b) Write design procedure for Knuckle joint.

c) Define following terms with reference to compression spring :

　i) Solid length

　ii) Free length

　iii) Spring index

　iv) Spring rate (Spring, stiffness)

d) Sketch flange coupling.

e) Compare welded joints with screwed joints.

Marks

5. **Attempt any TWO of the following:**   12

   a) Find the power that can be transmitted by a shaft of 40 mm diameter rotating at 200 r.p.m., if maximum shear stress is not to exceed 85 MPa.

   b) Explain design procedure of foot lever with neat sketch.

   c) State selection procedure of helical compression spring from manufacturer's catalogue.

6. **Attempt any TWO of the following:**   12

   a) Explain Design procedure of cotter joint.

   b) Write selection procedure of ball bearings from manufacturer's catalogue.

   c) Explain general considerations in machine design.

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