22473

22223

3 Hours / 70 Marks Seat No. | | | | | | | | |

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 FIVE of the following: **10**

a) State any four applications of knuckle joint.

b) State strength equation of Sunk key.

c) Define strain and state different types of strain.

d) Classify bearing.

e) Define neutral axis.

f) State formula to calculate torsional strength of shaft.

g) State four types of stresses acting on machine elements.

Marks

2. Attempt any THREE of the following: **12**

a) Define bearing pressure and state the formula to calculate bearing pressure.

b) State different types of welded joints and sketch it.

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

d) Explain the term life of bearing.

3. Attempt any THREE of the following: **12**

a) Write flexural formula and state meaning of each term used in it.

b) State requirements of a good shaft coupling.

c) Explain different forms of threads with their relative advantages and applications.

d) A beam 100 mm wide and 250 mm deep is subjected to a shear force of 40 kN at. Find shear stress induced in the beam.

e) Explain various stresses induced in helical compression spring.

4. Attempt any THREE of the following: **12**

a) Explain maximum normal stress theory and maximum shear stress theory.

b) Design a knuckle joint to transmit 150 KN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression.

c) Define following terms with reference to compression spring:

i) Solid length

ii) Free length

iii) Spring index

iv) Spring rate (Spring stiffness)

d) Explain in brief working of flexible coupling with neat sketch.

e) Explain various types of stresses develop in the power screw and write their strength equation.

Marks

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

a) A solid circular shaft is replaced by a hollow circular shaft of same material whose external diameter is twice the internal diameter. Both the shafts are required to transmit same power at same speed. Calculate percentage saving in weight, if both shafts have same strength.

b) Design a right-angled bell crank lever. The horizontal arm is 500 mm long and a load of 4.5 kN acts vertically downward through a pin in the forked end of this arm. At the end of the 150 mm long arm which is perpendicular to the 500 mm long arm, a force P act at right angles to the axis of 150 mm arm through a pin into a forked end. The lever consists of forged steel material and a pin at the fulcrum. Take the following data for both the pins and lever material:

i) Safe stress in tension = 75 MPa

ii) Safe stress in shear = 60 MPa

iii) Safe bearing pressure on pins = 10 N/mm^2

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

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

a) Design single cotter joint to transmit 200 kN. Allowable stresses for the material are 75 MPa in tension and 50 MPa in shear.

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

c) Explain general considerations in machine design.

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