17525

16172

4 Hours / 100 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****.*

Marks

1. A) Attempt **any three** of the following : **12**

a) Give classification of design.

b) Define the following terms :

i) factor of safety ii) Endurance limit.

c) Enlist the applications of following joints :

i) turn buckle ii) knuckle joint.

d) Enlist types of keys and draw neat sketch of any two types of keys.

B) Attempt **any one** of the following : **6**

a) State any three types of levers with neat sketch. Also mention application one of each.

b) State the design procedure for semi-elliptical leaf spring.

2. Attempt **any four** of the following : **16**

a) State the importance of S – N diagram for variable stresses.

b) State the material used for following components with proper justification :

i) piston ii) crank shaft.

c) Explain maximum principal stress theory.

d) State the effect of keyway on transmission shaft strength.

e) Explain the concept of hipping.

3. Attempt **any four** of the following : **16**

a) With neat sketch, show the thrust side and non-thrust side of I.C. engine piston.

b) Determine the thickness of plain cylinder head for 300 mm cylinder diameter. The maximum gas pressure is 3.2 N/mm^2. Take allowable tensile stress for cylinder cover is 42 N/mm^2 and constant is 0.1.

c) Explain concept of critical speed of shaft.

d) Determine the dimensions of a rectangular sunk key. The shaft of 100 mm diameter to resist a torque of 5000 N – m. The material for shaft key is mild steel.
Shear stress is 50 N/mm^2 and crushing stress is 120 N/mm^2.

e) State the design procedure for single plate clutch on the basis of uniform pressure theory.

P.T.O.

Marks

4. A) Attempt **any three** of the following : **12**

a) Enlist any four factors affects selection of factor of safety.

b) State any four design considerations for design of piston.

c) State design procedure of propeller shaft.

d) Draw neat labelled sketch of turn buckle.

B) Attempt **any one** of the following : **6**

a) Explain the following terms :

i) Concept of standardisation ii) Preferred number.

b) State the design procedure of bell crank lever.

5. Attempt **any two** of the following : **16**

a) Design a cotter joint to support a load varying from 30 kN in compression to 30kN in tension. The material used is carbon steel. For which following allowable stresses may be used. The load is applied statically.
Tensile stress = compressive stress = 50 MPa
Shear stress = 35 MPa and
Crushing stress = 90 MPa

b) State the design procedure of bush pin type flexible coupling.

c) A four speed gear box is to be constructed for providing the ratio 1.0, 1.46, 2.28 and 3.93 to 1 as nearly as possible. The module of gear is 3.25 mm and the smallest pinion is to have atleast 15 teeth. Determine the suitable number of teeth of different gear. Also calculate the distance between main and lay shaft.

6. Attempt **any two** of the following : **16**

a) Write design procedure for connecting rod.

b) A four stroke diesel engine has the following specifications :
Brake power = 5 kW
Speed = 1200 rpm
Indicated mean effective pressure = 0.35 N/mm^2
Mechanical efficiency = 80%
Determine :

i) Bore and length of cylinder ii) Thickness of the cylinder head
Assume : l = 1.5 D or 1.08 D
Constant = C = 0.1
Tensile stress for cylinder cover = 52 N/mm^2

c) Design the piston pin with following data :

i) Maximum pressure on piston = 4N/mm^2

ii) Diameter of piston = 70 mm

iii) Allowable stresses due to bearing, bending and shear are 30 N/mm^2, 80 N/mm^2 and 60 N/mm^2 respectively.