17525

16117

4 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Illustrate your answers with neat sketches ***wherever*** *necessary.*
(3) Figures to the ***right*** *indicate* ***full*** *marks.*
(4) Assume suitable data, if ***necessary****.*
(5) Use of Non-programmable Electronic Pocket Calculator is ***permissible****.*

Marks

1. A) Attempt **any three** : **12**

a) Explain design consideration in automobile design.

b) Explain Ergonomic aspects of machine design.

c) Write two application of each of the following :

i) Turn buckle ii) Knuckle joint

d) State and explain the effect of Keyways on shaft.

B) Attempt **any one** : **6**

a) Write stepwise design procedure for a bushed pin flexible coupling.

b) Design a knuckle joint (i) Fork end (ii) Eye end and (iii) Knuckle pin where a tensile force 40×10^3N is acting. The safe stress in the parts are shear stress = 60 N/mm^2, Tensile stress = 80 N/mm^2, and crushing stress = 40 N/mm^2.

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

a) Derive the relation for torque to be transmitted by single plate clutch considering uniform wear condition.

b) Define the terms :

i) Fatigue and ii) Endurance limit with suitable example.

c) List No.of different factors to be consider to find design load and explain any two of them.

d) Design a propeller shaft to transmit 5 kW at 5000 r.p.m. with gear box reduction 16 : 1. Assume permissible shear stress for shaft material is 45 N/mm^2.

e) Explain maximum principal stress theory of failure.

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

a) Describe the design procedure of a rear axle.

b) Draw and explain the stress strain diagram for ductile material.

c) Describe the Nipping of leaf springs with neat sketch.

P.T.O.

Marks

d) Design a rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for key material are 42 N/mm^2 and 70 N/mm^2, respectively. For shaft to resist torque 5000 Nm.

e) Find the diameter of a solid shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for the shaft may be taken as 360 N/mm^2 and the factor of safety as 8.

4. A) Attempt **any three** : **12**

a) Define standardisation and state the four advantages of it.

b) Define a lever. Describe three basic types of lever.

c) A single plate clutch with both side effective, has outer and inner diameter 300 mm and 200 mm respectively. The maximum intensity of pressure at any point in the contact surface is not exceed 0.1 N/mm^2. If the coefficient of friction is 0.3, determine the power transmitted by clutch at a speed of 2500 r.p.m.

d) Describe stepwise procedure for designing the piston crown of an engine for bending strength and thermal consideration.

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

a) Explain design procedure of a connecting rod.

b) Design fulcrum pin of rocker arm which carries load of 5000 N and has equal lengths of load arm and effort arm. The length of arms are 250 mm. The angle between the arms is 160°. The allowable bearing pressure is 7 N/mm^2

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

a) Design a socket and spigot type cotter joint which has to withstand a load 20×10^3N. Take safe tensile stress 56N/mm^2, shear stress 40N/mm^2 and crushing stress 40 N/mm^2.

b) Draw the neat sketch of sliding mesh gear box and write the design procedure for teeth calculation.

c) Design the piston pin with following data. Maximum pressure on the piston is 4 N/mm^2, diameter of piston 70 mm, Allowable stresses, due to bearing is 30 N/mm^2, bending 80 N/mm^2, and shear stress 60 N/mm^2.

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

a) A semi-elliptical spring has an overall length of 1m. and sustain a load of 70 kN at its centre. The spring has 3 full length leaves and 15 graduated leaves with a central band of 100 mm width. All the leaves are to be stressed to 400 N/mm^2 when fully loaded. The ratio of total spring depth to that of the width is 2. Young modulus $E = 0.2 \times 10^6$ N/mm^2, Determine :

1) Thickness and width of the leaves.

2) Initial gap that should be provided between full length and graduated leaves before the band load is applied.

3) The load exerted on the band after the spring is assembled.

b) Describe in detail the design procedure used to design the piston rings and piston skirts.

c) Describe in detail design procedure to design

i) Thickness of cylinder head ii) Cylinder head bolts or studs.