17525

21819

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.

Marks

1. (A) Attempt any THREE : **12**

(a) What is factor of safety ? How it is selected ?

(b) Explain role of ergonomics in automobile design.

(c) State two applications of spigot type cotter joint and turn buckle.

(d) State types of keys with their applications.

(B) Attempt any ONE : **6**

(a) Explain design procedure for leaf spring.

(b) Describe the procedure to design of fulcrum pin of rocker arm.

2. Attempt any FOUR : **16**

(a) Describe design procedure for fully floating rear axle.

(b) Draw stress, strain diagram for ductile material and state its importance.

(c) Design the knuckle joint is required to withstand a tensile load of 20 kN if permissible stress are $\sigma_{+} = 56$ N/mm^2, $\tau = 40$ N/mm^2, $\sigma_c = 70$ N/mm^2.

(d) Define lever. Describe three basic types of lever.

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

3. Attempt any FOUR : **16**

(a) With neat sketch of socket and spigot cotter joint, write procedure to design of cotter only.

(b) What are the advantages of standardizations ?

(c) Calculate cylinder bore diameter and stroke length for four stroke six cylinder engine developing 90 kW at 3000 rpm. The brake mean effective pressure is 11×10^5 N/m^2 and $\frac{L}{D} = 1.2$.

(d) Draw a labelled sketch of a knuckle joint.

(e) Explain design procedure for muff coupling.

4. (A) Attempt any THREE : **12**

(a) Explain concept of nipping.

(b) State design procedure for piston ring and skirt length.

(c) Design the turn buckle. Find the diameter of rod and coupler nut to withstand a load of 1600 N. Given permissible stresses are 70 N/mm^2 and 60 N/mm^2 in tension and shear respectively.

(d) A multiplate disc clutch has 6 active friction surface power transmitted is 20 kW at 400 r.p.m. inner and outer radius of the friction surfaces are 90 mm and 120 mm respectively. Assuming uniform wear, with a co-efficient of friction 0.25. Find the maximum axial intensity of pressure between the discs.

(B) Attempt any ONE : **6**

(a) State step wise procedure for component design.

(b) A single plate with both sides effective has outer and inner diameter 300 mm and 200 mm respectively. The maximum intensity of pressure at any point of contact is not to exceed 0.2 N/mm^2. If the co-efficient of friction is 0.3. Determine the power transmitted by clutch at shaft speed 3000 r.p.m.

5. Attempt any TWO : **16**

(a) Describe the theories of failure of maximum principal stress theory and maximum shear stress theory.

(b) An automobile gear box gives three forward and a reverse speed with top gear of unity and bottom and reverse gear ratio of 3.3 : 1, the center distance between shaft is 110 mm approximately. Gear teeth of module 3.25 mm are to be employed. Determine different gear ratios of various gears and number of teeth.

(c) Explain the design procedure for cylinder head thickness and bolts.

6. Attempt any TWO : **16**

(a) Design the piston pin with following data (i) P_{max} = 4.5 N/mm^2 (ii) Diameter of piston = 70 mm. Allowable stresses due to bearing, bending and shear are given 30 N/mm^2, 80 N/mm^2 and 60 N/mm^2 respectively.

(b) Design the connection rod cross-section with the following data P_{max} = 5 N/mm^2, Piston diameter = 70 mm, stroke length = 80 mm effective length of connecting rod = 140 mm maximum allowable stress in the rod in clipping is 110 N/mm^2. Take Rankine constant for steel $\frac{1}{6000}$.

(c) Design flange coupling to transmit 15 kW at 900 r.p.m. The service factor may be used 1.3. Following permissible stress may be assumed shear stress for shaft, bolt and key material is 40 MPa, crushing stress for bolt and key material is 80 MPa and shear stress for cast iron is 8 MPa.
