17525

11718

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

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Illustrate your answers with ***neat*** *sketches* ***wherever*** *necessary.*
(3) Assume suitable data, if ***necessary****.*
(4) Use of Non-programmable Electronic Pocket Calculator is ***permissible****.*
(5) Mobile Phone, Pager and any other Electronic Communication devices are ***not*** *permissible in Examination Hall.*

Marks

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

a) Define factor of safety. State the factors affecting its selection.

b) Define the term :

i) Fatigue and

ii) Endurance limit.

c) State the effect of keyways on the strength of shaft.

d) Determine the bore and length of cylinder of 4-stroke diesel engine for following specification – Brake Power – 5KW, speed – 1200 RPM, P_m – 0.35 N/mm^2, Mechanical efficiency – 80%, $L/D = 1.08$.

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

a) Explain the design procedure of Rocker arm for operating exhaust valve.

b) A single plate dry clutch transmits 7.5 KW at 900 rpm. The axial pressure is 0.7 N/mm^2. Determine the outer and inner diameters of frictional surfaces if $\mu = 0.25$. Take ratio of diameter as 1.25. Assume uniform wear theory.

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

a) Explain maximum shear stress theory of failure.

b) Enlist any two applications of cotter and knuckle joint.

c) State different types of levers with suitable applications (any two).

d) Explain why nipping of leaf spring is necessary with neat sketch.

e) Determine the thickness of plain cylinder head for 0.3 m cylinder diameter. The maximum gas pressure is 3.2 N/mm^2. Take C = 0.1, σ_t = Tensile stress = 42 N/mm^2.

P.T.O.

Marks

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

a) Explain aesthetic considerations in designing of automobile components.

b) Explain the term :

i) Standardisation and

ii) Interchangeability in design.

c) Write the type of Keys with their applications.

d) State the design considerations in semi-elliptical leaf spring.

e) Write the design procedure for designing of piston head or crown by strength consideration.

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

a) State the general design considerations.

b) Design turn buckle rod diameter to withstand a load of 1600 N, if permissible stresses are 70 N/mm^2 and 60 N/mm^2 in tension and shear respectively.

c) Design a rear axle for engine power – 40 KW at a speed of 2000 rpm. Lower gear box ratio – 3 : 1 and differential reduction as 5. Take allowable shear stress is 56 MPa.

d) Draw a neat sketch of constant mesh gear box.

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

a) Define stress concentration. State its causes. Explain the different methods to reduce stress concentration with suitable example.

b) Write the design procedure for connecting rod.

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

a) Design socket and spigot type cotter joint with the following data : Load = 30 KN; allowable tensile stress = 50 MPa; Allowable crushing stress = 90 MPa and allowable sheat stress = 35 MPa.

b) A hollow propeller shaft of a car with outside diameter of 75 mm transmits 22.5 KW at 1500 rpm to the wheels which are 900 mm in diameter. If allowable sheat stress is 60 N/mm^2, Find the cross section of the shaft. Take gear box reduction 5.

c) Design a piston pin with following data : Max. gas pressure = 4N/mm^2, Diameter of piston = 70 mm, allowable stresses due to bearing, bending and shear are 30N/mm^2, 80 N/mm^2, 60 N/mm^2 respectively.

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

a) Design a flange coupling to transmit 15 KW at 900 rpm. for following data.
Service factor = 1.35; shear stress = 40 MPa; shear stress for C.I = 08 MPa, Crushing stress = 80 MPa.

b) 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 the gear is 3.25 mm and the smallest pinion is to have at least 15 teeth. Determine suitable number of teeth of the different gear. Also calculate the distance between shafts.

c) i) Design piston ring for following data : Number of rings = 5, wall pressure P_W = 0.035 N/mm^2, Bending stress for ring = 85 N/mm^2, diameter of cylinder bore = 240 mm.

ii) Design the skirt length of piston with following data for petrol engine. Maximum pressure inside the cylinder = 6.5 N/mm^2, piston diameter = 100 mm, side thrust is limited to 10% of maximum load on piston, Allowable bearing pressure = 0.3 N/mm^2.