22558

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

15 minutes extra for each hour

Instructions – (1) All Questions are *Compulsory.*

(2) Answer each next main Question on a new page.

(3) Illustrate your answer 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) Define standardization and state any four advantages of standardization.

b) Draw S-N curve and define endurance limit.

c) State and justify the material used for tie rod.

d) Compare advantages and disadvantages of cast iron and aluminium as material for Piston.

e) A push rod has a cross sectional area of 20 mm^2. At a certain point when operating a valve the force in the rod is 1 kN. Determine the compressive stress in the rod.

f) State any two effects of Aesthetics on the automobile component design.

g) Define factor of safety for fatigue loading.

Marks

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

a) List three basic modes of failure and give examples of automobile components which fail in these modes.

b) Define stress concentration. Sketch the remedies to reduce stress concentration in following cases:

i) A plate with V-Notch subjected to tension.

ii) Cylindrical member with shoulder subjected to bending.

c) Draw a neat labelled sketch of propeller shaft and explain reasons for using tubular sections for propeller shaft

d) List functions and materials used for following components:

i) Rocker arm.

ii) Push rod.

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

a) Describe procedure to design fully floating rear axle.

b) Explain design procedure for I-section of front axle.

c) Describe procedure to design cross section of a connecting rod and write proportions at big end and small end of connecting rod.

d) Explain use of preferred numbers in design.

e) Explain load factor and service factor with their applications.

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

a) The rear axle shaft connecting differential to the side wheel is required to transmit 30kW at 1500 rpm. If maximum torque is two times average torque and allowable shear stress in shaft material is 80 N/mm^2. Find diameter of axle shaft if:

i) Shaft is solid and

ii) Shaft is hollow with outside diameter 1.5 times the inside diameter.

Marks

b) A single plate clutch effective on both sides is required to transmit 25 kW at 3000 rpm. Determine the outer and inner radii of frictional surfaces, if the coefficient of friction is 0.255, the ratio of radii is 1.25 and maximum pressure on plate is not to exceed 0.1 N/mm^2. Also determine the axial thrust to be provided by springs. Apply the uniform wear theory.

c) Design a valve spring for exhaust valve for a four stroke engine using following data:
Diameter of valve head = 7.5 mm,
Lift of valve = 25 mm.
Maximum suction pressure = 0.02 MPa below atmosphere.
Spring stiffness = 10 N/mm.
Spring index = 8.
Permissible torsional shear stress for spring wire = 300 N/mm^2
Modulus of rigidity = 84×10^3 N/mm^2. Total gap between consecutive coils when spring is subjected to maximum force can be taken as 15% maximum compression. Spring has square and ground ends.

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

a) Explain stepwise procedure to design a piston.

b) Compare front axle and rear axle on basis of force to be supported, stresses induced and cross section used.

c) Define ergonomics and illustrate ergonomic considerations in design of display in automobiles.

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

a) Determine the smallest size of punch that can be made to punch 10 mm thick M.S. plate having ultimate shear stress as 0.3 kN/mm^2 and permissible crushing stress for hardened punch is 1.3 kN/mm^2.

b) Explain Nipping of leaf spring with neat sketch and state formula for final stress and deflection of leaf spring after nipping.

c) Explain stepwise procedure for design of a tie rod.

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