

Total No. of Questions : 10]

SEAT No. :

P2240

[Total No. of Pages : 4

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**B.E. (Automobile Engineering) (Semester -II)**

**AUTOMOTIVE SYSTEM DESIGN**

**(2012 Pattern) (End -Sem)**

*Time : 2.30 Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Solve question No. 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.*
- 2) *Neat diagrams must be drwn whenever necessary.*
- 3) *Figure to the right indicate full marks.*
- 4) *Use electronic pocket calculator.*
- 5) *Assume suitable data if necessary.*

**Q1) a) Answer the following: [6]**

- i) What are the drawbacks with metallic lining?
  - ii) What causes the clutch to slip?
  - iii) List the desirable properties of lining material.
- b) What are the advantages of increasing number of gear ratio steps in automobile gearbox? [4]

OR

**Q2) a) A four speed gear box is to have the following gear ratio 1.0, 1.5, 2.48 and 3.93. The centre distance between the lay shaft and main shaft is 73.12 mm and the smallest pinion is to have at least 15 teeth with a diametral pitch of 3.25mm. Find the number of teeth of the various wheels. Find the exact gear ratios. [6]**

b) What are the design requirements of clutch? [4]

**Q3) a) Enlist the bearing types. [2]**

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- b) An automobile engine develops a maximum torque of 162 Nm and the low gear ratio of transmission is 2.75, while the back axle ratio is 4.25. The effective wheel radius is 0.325 m, the coefficient of friction between the tyre and road surface is 0.6. If the permissible shear stress is  $32370 \times 10^4$  Pa, determine the maximum shaft diameter. Assuming the load is nearly torsional. What is the maximum load on each wheel? [8]

OR

- Q4)** a) Enlist the types of gear train. [2]  
b) Name the basic types of universal joints and explain any one in detail with sketch. [8]

**Q5)** Explain the following: [18]

- a) Brake fade
- b) Brake torque
- c) Brake balance
- d) Braking efficiency
- e) Properties of friction lining
- f) Components used in hydraulic brake system

OR

**Q6)** In a hydraulic single line braking system the force on foot pedal is 100N, pedal leverage ratio is 4.4, cross sectional area of master cylinder is  $4 \text{ cm}^2$ , cross sectional area of front piston  $20 \text{ cm}^2$ . Cross sectional area of the rear piston is  $5 \text{ cm}^2$ . Distance moved by effort is 1 cm. Calculate the following. [18]

- a) Front to rear brake ratio
- b) Total force ratio

- c) Distance moved by output
- d) Cylinder movement ratio
- e) Total movement ratio

- Q7)** a) i) Explain the design features of leaf spring. [12]
- ii) Discuss the vehicle dynamics
  - iii) Discuss the forces on vehicle suspension system
- b) Write a note on air springs. [4]

OR

- Q8)** a) A truck spring has 12 number of leaves, 2 of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 KN with a permissible stress of 280 N/m<sup>2</sup>. Determine the thickness and the width of steel spring leaves. The ratio of total depth to the width of the spring is 3. Also determine the deflection of the spring. [12]
- b) Explain in brief under steer and over steer. [4]
- Q9)** a) What do you understand by optimum and adequate design? [6]
- b) A hollow shaft is required to transmit 60 KW at 110 rpm. The maximum torque being 20% greater than the mean. The shear stress is not to exceed 63Mpa and twist in a length of 3 meters not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to external diameter is 3/8. Take modulus of rigidity as 84 Gpa. [10]

OR

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- Q10)** a) What are the aesthetic and ergonomic considerations in design? [6]
- b) Explain the optimization techniques in design. [5]
- c) Write a short note on Design for natural tolerance. [5]

