

Total No. of Questions : 10]

SEAT No. :

P3546

[Total No. of Pages : 4

[4959] - 1231

B.E. (Automobile Engineering)

Automotive System Design

(2012 Pattern) (Semester-II)

Time : 2.30 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Solve questions Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8, Q9 or Q10.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures 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 causes the clutch to slip?
 - ii) What are the drawbacks with metallic lining?
 - iii) Why centrifugal clutch is more suitable for heavy duty applications.
- b) What are the advantages of increasing the number of gear ratio steps in automobile gearbox? **[4]**

OR

Q2) a) a motor car engine develop 5.9KW at 2100RPM.find the suitable size of clutch plate having frictional lining riveted on both side to transmit the power, under the following conditions; **[6]**

- i) Intensity of pressure on the surface not to exceed 6.87×10^4 Pa
 - ii) Slip torque and losses due to wear etc.is 35% of engine torque
 - iii) Coefficient of friction on contacting surface is 0.3
 - iv) Inside diameter of the friction plate is 0.55 times the outside diameter.
- b) Explain the selection of bearing in gear box. **[4]**

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- Q3)** a) Write note on gear train types. [2]
b) Two shaft are connected by a universal joint. The driving shaft rotates with at a uniform speed of 1200rpm.determine the greatest permissible angle between the shaft axes so that the total fluctuation of speed does not exceed 100rpm.also calculate the maximum and minimum speed of the driven shaft. [8]

OR

- Q4)** a) When is maximum vehicle speed attained? [2]
b) An automobile engine develops 28KW at 1500rpm and its bottom gear ratio is 3.06.if a propeller shaft of 40mm outside diameter is to be used, determine the inside diameter of mild steel to be used, assuming a safe shear stress of 55×10^3 Kpa for the MS. [8]

- Q5)** a) In shoe-brake with leading and trailing shoe, the total actuating force of 471N acts a distance of 0.15m from the pivot of the shoe which is 0.075m from the axis of the drum of radius 0.09m.the shoe have symmetrical lining with coefficient of friction 0.45.if the effective radius of the friction force is 0.1 m, calculate the total braking torque, when [12]
i) The actuating mechanism gives equal force to the shoe, and
ii) When the actuating mechanism gives the shoe equal displacement
b) Why is disc brake preferred for front wheel and the drum brake for rear wheel. [6]

OR

- Q6)** a) In a hydraulic single line braking system the force on foot pedal is 100N, pedal leverage ratio is 4, cross sectional area of master cylinder is 4 cm^4 , cross sectional area of front piston 20 cm^2 . Cross sectional area of the rear piston is 5 cm^2 . Distance moved by effort is 1 cm. Calculate [12]
i) front to rear brake ratio
ii) percentage of front and rear braking,
iii) total force ratio,
iv) distance moved by output,
v) cylinder movement ratio, and
vi) Total movement ratio.
b) Explain: [3x2=6]
i) Brake Fade
ii) Brake Torque
iii) Properties of friction lining

- Q7) a)** A vehicle spring of semi elliptic type has leaves of 75 mm width and 10 mm thickness and effective length is 900 mm. If the stress is not to exceed 220725 kPa when the spring is loaded to 4905 N, estimate the required number of leaves and the deflection under this condition. If the spring is just flat under load, what is the initial radius? Take $E=196.2 \times 10^6$ kPa. **[12]**
- b) State and explain any one steering gear Mechanism. **[4]**

OR

Q8) Solve any four. **[4x4=16]**

- a) What is nipping in leaf spring?
- b) What are the characteristics of over-steer?
- c) Define
- i) camber angle.
 - ii) Scrub radius.
- d) Write a note on air spring.
- e) Discuss general design considerations of suspension system.

Q9) a) it is observed from a sample of 300 forgings that the lengths are normally distributed with mean of 150.5 mm and a standard deviation of 0.02 mm. if 15 forgings are rejected, determine the tolerance specified by the designer. **[12]**

Use following table for the areas under the standard normal distribution curve.

z	0	1	2	3	4	5	6	7	8	9
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817

- b) Define Mechanical reliability. **[4]**

OR

- Q10)** a) A tensile bar of length 200mm is subjected to the constant tensile force of 5000N. Design the bar with the objective of minimizing the material cost, out of the following materials: **[12]**

Consider factor of safety is 1

Material	Mass density ρ kg/m ³	Material cost per unit mass C, Rs/kg	Yield strength S_{yt} N/mm ²
Plain carbon steel	7500	16	130
Aluminum Alloy	3000	32	50
Titanium Alloy	4800	480	90
Magnesium Alloy	2100	32	20

- b) Solve any One: **[4]**

- i) Discuss 'Adequate and optimum Design.
- ii) Explain aspects of Aesthetic Design.

