Total No. of Questions : 10]

SEAT No. :

P3085

[Total No. of Pages : 4

[5354]-571
B.E. (Automobile Engineering) (Semester - II)
AUTOMOTIVE SYSTEM DESIGN
(2012 Pattern)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Solve question 1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10.***
2) ***Neat diagram must be drawn wherever necessary .***
3) ***Figure to the right indicate full marks.***
4) ***Use electronic pocket calculator.***
5) ***Assume suitable data if necessary.***

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

i) Why multi - plate clutch is preferred in two - wheeler?

ii) What are the design requirements of clutch?

b) What are the advantages of increasing the number of gear ratio steps in automobile gearbox? **[4]**

OR

Q2) a) A centrifugal clutch is to transmit 14.72 KW at 900 rpm.the shoe are four in number the speed at which engagement begins is $3/4^{th}$ of running speed. the inside diameter of the pulley rim is 140 mm and the center of gravity of the shoe lives at 120 mm from the center of spider. The shoes are lined with the friction material for which the coefficient of friction taken as 0.25. The angle sustained by the shoes at center of the spider is 60° and the pressure exerted on the shoes is 9.81×10^4 N/m^2.determine. **[6]**

i) Weight of shoe.

ii) Size of each shoe.

b) Write note on gear train with types. **[4]**

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Q3) a) In a gear box the clutch shaft pinion has 14 teeth and low gear main shaft pinion 32 teeth. The corresponding lay shaft pinions have 36 and 18 teeth. The rear axel ratio is 3.7:1 and the effective radius of the rear tyre is 0.355 m. Calculate the car speed for the above system at an engine speed of 2500 mm. **[6]**

b) What are the merits of cross type joint? **[4]**

OR

Q4) Any two. **[10]**

a) What should be the characteristics of a propeller shaft?

b) Why centrifugal clutch is more suitable for heavy duty applications.

c) Explain the general design procedure of front axle

Q5) 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 $4cm^2$, cross sectional area of front piston $20cm^2$. Cross sectional area of the rear piston is $5cm^2$. And distance moved by effort is 1cm. Calculate the followings : **[10]**

i) Front to rear brake ratio

ii) Total force ratio

iii) Distance moved by output

iv) Cylinder movement ratio

v) Total movement ratio

b) What are the components of hydraulic braking system? Explain their functions. **[6]**

OR

Q6) a) Two disc brake pads operate at a mean radius of 0.14m. the force applied to each pad is 4450N and the coefficient of friction between each pad and disc is 0.35.when the disc rotates at 500rpm, calculate. **[10]**

i) the frictional torque acting on the disc,

ii) the work done per minute by this torque, and

iii) the heat energy generated per second.

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b) Solve Any two **[6]**

i) Properties of friction lining.

ii) What is the braking efficiency? Explain

iii) Explain braking of a vehicle on a curved path

Q7) a) A typical coil suspension spring has 10 effective coils if a mean diameter 125mm and made out of wires of diameter 15mm. The spring is designed to carry a maximum static load of 3531.6 N. Calculate the shear stress and the deflection under the above loading.

If a maximum shear stress of 637650 KPa is allowable in the material, then what is the possible clearance in the spring? Take the value of $G = 73575 \times 10^3$ Kpa. **[12]**

b) State and explain any one steering gear Mechanism. **[6]**

OR

Q8) a) Solve Any three. **[12]**

i) Write a note on air spring.

ii) Discuss general design considerations of suspension system.

iii) What is nipping in leaf spring?

iv) What are the functions of steering system?

b) A rack-and pinion steering has a pinion of 16mm pitch circle diameter. What effort must be applied on the 320mm diameter steering-wheel to overcome a resistance of 500N experienced transversely on the rack? **[6]**

Q9) 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 : **[16]**

Consider factor of safety is 2.

Material	Mass Density ρ Kg/m^3	Material cost per Unit Mass C, Rs/kg	Yield strength S_{vt} N/mm^2
Plain Carbon Steel	7500	16	130
Aluminium Alloy	3000	32	50
Titanium Alloy	4800	480	90
Magnesium Alloy	2100	32	20

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OR

Q10) Solve any Four : **[16]**

a) What is Ergonomics?

b) How does ergonomics work?

c) Explain the Johnson method of optimum design.

d) Define Mechanical reliability.

e) Write note on statistical considerations in design.

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