BR/Sem VII/CBSGS/AUTO/MJ2019/17-05-19

Time: 3 Hours   **Marks: 80**

Note: 1.   Question No.1 is compulsory.
         2.   Attempt any three questions from remaining.
         3.   Use of Design Data Hand Book is permitted.
         4.   Assume suitable data if required.

1.Attempt any Four of the following   4×5
   (a)   Explain the method of lubrication provided for the engine through the connecting rod?
   (b)   Explain why piston pin located at or above the middle of skirt length?
   (c)   What are the fuctions of oil scraper rings?
   (d)   What are the cooling systems for engine cylinders? Where do use them?
   (e)   Why do inlet and exhaust valves have conical heads and seats?

2.   (a)   Design a connecting rod for a high speed single cylinder diesel engine using the following data   15
cylinder bore=100 mm
Length of connecting rod=300 mm
Speed=2000 rpm
mass of reciprocating parts=1.5 kg
maximum gas pressure=2.45 MPa
Factor of safety against buckling=5
Assume suitable data and state the assumptions you make.

   (b)   More number of thin piston rings are preferred over small number of thick rings. Why?   5

3   (a)   Design a cast iron piston for four stroke single cylinder diesel engine with the following data   20
cylinder bore=200mm
Stroke= 250mm
maximum gas pressure = 4.5 N/mm^2
Indicated mean effective pressure = 0.75 N/mm^2
Mechanical efficiency = 80%
Fuel consumption=0.30 kg per BP per hr.
Higher calorific value of fuel=44 × 10^3 kJ/kg
Speed=2000 rpm
Any other data required for the design may be assumed.

4.   (a)   Design an exhaust valve for a horizontal disel engine using following data   15
Cylinder bore = 250 mm
Length of stoke = 300 mm
Engine speed = 600 rpm
Maximum gas pressure = 4 Mpa
Seat angle = 45°
Mean velocity of gas through port = 50 m/s
Allowable bending stress for valve = 50 N/mm^2

   (b)   Explain design considerations for centre crankshaft.   5

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5. (a) A cone clutch with asbestos friction lining transmits 35 KW power at 550rpm. The 10 coefficient is 0.2 and the permissible intensity of pressure is 0.38 N/mm². The semi cone angle α is 12.5°. The outer diameter is fixed as 300 mm from space limitations. Assuming uniform theory calculate
   1. Inner diameter
   2. The face width of the friction lining
   3. The force required to engage the clutch

   (b) A sliding mesh gearbox contains 4 pairs of gears for providing 4 forward speeds and 10 a reverse speed. Speed ratio of clutch shaft gear and lay shaft gear is 2.5.calculate the number of teeth in all the gears with the assumptions that minimum number of teeth required for any gear to avoid interference is 18.Finally, calculate actual gear ratios. The gearbox should have the following speed ratios approximately.
   First gear=4.8
   Second gear=3.28
   Third gear=2.25
   Fourth gear=1
   Reverse speed gear=5.0

6. (a) A semi-elliptic multi leaf spring is used for the suspension of the rear axle of a truck. 15 It consists of two extra full length leaves and ten graduated length leaves including the master leaf. The centre-to-centre distance between the spring eyes is 1.2m. The Spring is to be designed for a maximum force of 40 kN. The leaves are pre-stressed so as to equalize stresses in all leaves. Determine
   i)The cross-section of leaves; and
   ii)The deflection at the end of the spring.

   (b) Why clutches are usually designed on the basis of uniform wear? 05

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