B.E/ Auto/Sem VII/CBSGS/AD/05/12/17

Q. P. Code: 25209

(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) Why are connecting rods made I sections? Name the materials used for connecting rod.
   (b) What is internal expanding shoe brake? What are the advantages and disadvantages?
   (c) Explain valve gear mechanism for Horizontal engine with neat labeled diagram.
   (d) What are the different materials used in advanced automotive body structures.
   (e) Design a propeller shaft for an automotive engine developing 30kW at 1500rpm. The lower gear ratio being 3.5 and the diameter ratio 0.55. Assume a shear stress of 56Mpa for the material of the shaft.

2. (a) Design a connecting rod for a high speed diesel engine using the following data 15
   cylinder bore=125 mm
   length stroke=140 mm
   Length of connecting rod=300 mm
   Speed=2000 rpm
   mass of reciprocating parts=1.5 kg
   maximum gas pressure=3.5 MPa
   Factor of safety against buckling=5
   Assume suitable data and state the assumptions you make.
   (b) Short note on design of piston ring. 5

3. (a) Design a cast iron piston for a single acting four stroke diesel engine with the following data 15
   cylinder bore=300mm
   Stroke=450mm
   maximum gas pressure=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.
   (b) Explain the types of piston and their functions. 5

TURN OVER

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4. (a) Design various component of valve gear mechanism for horizontal petrol engine for following data: 15

Cylinder Bore	=250mm
stroke	=300mm
Effective length of each arm	=150mm
Angle between two arms	=165°
Speed	=450RPM
maximum gas pressure	=3.5MPa
mass of valve	=0.5kg
seat angle of valve	=45°
Back pressure when the exhaust valve open	=0.4 MPa
Maximum suction pressure	=0.02MPa

The valve opens 33°before outer dead center and closes 1° after inner dead center it opens with constant acceleration and deceleration for each half of the lift.

(b) Explain design procedure for crankshaft. 5

5. (a) A centrifugal clutch transmitting 20kW at 750 rpm consists of four shoes. The clutch is to be engaged at 500 rpm the inner radius of the drum is 165 mm.The radius of the centre of gravity of the shoes is 140 mm, when the clutch is engaged. The coefficient of friction is 0.3, while the permissible pressure on friction lining is 0.1 N/mm^2.calculate the mass of each shoe; and the dimensions of friction lining 10

(b) A sliding mesh gearbox contains 4 pairs of gears for providing 4 forward speeds and 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. 10
First gear=4.5
Second gear=3.38
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. 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 leaves are made of steel 55Si2Mo90(S_{yt}=1500 N/mm^2 and E=207000 N/mm^2)and the factor of safety is 2.5.The Spring is to be designed for a maximum force of 30kN.The leaves are pre-stressed so as to equalize stresses in all leaves. Determine 10
i)The cross-section of leaves; and
ii)The deflection at the end of the spring

(b) Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The Ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter. When the ratio of inside to outside diameters is 0.5. 10

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