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Question Paper Code : 51098

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Sixth Semester

Automobile Engineering

AT 2351/AU 61/10122 AU 602 – AUTOMOTIVE ENGINE COMPONENTS DESIGN

(Regulation 2008/2010)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Give any two applications of interference fit.
2. What is tolerance grade?
3. Under what force, the big end bolts and caps are designed?
4. Specify the reason for use of tapered skirt for pistons.
5. Enumerate the design considerations for crank pin.
6. What is the net force acting on the crankshaft of an engine?
7. Define co-efficient of fluctuation of speed.
8. State the type of stresses induced in a rim flywheel.
9. Why the area of the inlet valve port is made larger than the area of exhaust valve port?
10. What are the methods and materials used in the manufacture of cam shafts?

PART B — (5 × 16 = 80 marks)

11. (a) A medium force fit on a 50 mm shaft requires a hole tolerance of 0.025 mm and a shaft tolerance of 0.016 mm. The maximum interference is to be 0.042 mm. How will you Dimension the hole and the shaft, if hole deviation is H?

Or

- (b) The maximum load on a petrol engine push rod 300 mm long is 1400 N. It is hollow having the outer diameter 1.25 times the inner diameter. Spherical seated bearings are used for the push rod. The modulus of elasticity for the material of the push rod is 210 kn/mm^2 . Find a suitable size for the push rod, taking a factor of safety of 2.5.

12. (a) Design a connecting rod for an (engine from the following data

Piston diameter = 125 mm

Stroke 150 mm

Length of connecting rod = 300 mm

Maximum gas pressure at 5% of stroke = 5 n/mm^2

Speed of engine = 1200 rpm

Mass of reciprocating parts = 2 kg

Factor of safety = 5

Material steel = 35 Ni Cr 60.

Or

- (b) A four stroke diesel engine has the following specifications :

Brake power = 5 kw

Speed = 200 rpm

Indicated mean effective pressure = 0.3 N/mm^2

Mechanical efficiency = 80%.

Determine :

- (i) Bore and length of the cylinder;
- (ii) Thickness of the cylinder head; and
- (iii) Size of studs for the cylinder head.

13. (a) Design a single-throw, double-view crank shaft made of forged steel for a single cylinder, vertical IC engine having cylinder diameter of 120 mm and stroke length of 160 mm. The engine develops 10 kw at 300 rpm. The explosion pressure is 2.5 N/mm^2 gauge. The maximum torque is developed when the crank shaft turns through 25° from the TDC position during the expansion stroke. The burnt gas Pressure at that moment is 2.0 N/mm^2 . The crank main bearings are 320 mm apart.

Or

- (b) Design an overhang crank shaft with two main bearings for an IC. engine with the Following data :
- Cylinder bore = 250 mm
Stroke length = 300 mm
Flywheel weight = 27 KN
Maximum pressure = 2.5 N/mm²
Maximum torque at crank rotation 30°. the pressure at that Instant 1.7 N/mm².

14. (a) The turning moment diagram for a multicylinder engine has been drawn to a scale of 1 mm = 1000 N-m and 1 mm = 6°. The areas above and below the mean turning moment line taken in order are 530, 330, 380, 470, 180, 360, 350 and 280 sq.mm. For the engine Find the diameter of the flywheel. The mean rpm, is 150 and the total fluctuation of Speed must not exceed 3.5% of the mean. Determine a suitable cross-sectional area of the rim of the flywheel, assuming the total energy of the flywheel to be 15/14 that of the rim. The peripheral velocity of the flywheel is 15m/s.

Or

- (b) Design a flywheel for a single-cylinder, four-stroke vertical cylinder diesel engine developing 4 Kw at 1500 rpm. Assume coefficient of speed fluctuation, $C_s = 0.01$.
15. (a) Design a rocker arm of I-section made of cast steel for operating an exhaust valve of a gas engine. The effective length of the rocker arm is 250 mm and the angle between the arm is 135°. The exhaust valve is 80 mm in diameter and the gas pressure when the valve begins to open is 0.4 N/mm². The greatest suction pressure is 0.03 N/mm² below atmospheric. The initial load maybe assumed as 0.05 N/mm² of valve area and the valve inertia and friction losses as 120 N. The ultimate strength of cast steel is 750 Mpa. The allowable bearing pressure is 8 N/mm² and the permissible stress in the material is 72 Mpa.

Or

- (b) The following data refer to a circular arc cam which operates flat faced follower :
- Least radius 50 mm; Total lift 25 mm; Flank radius 50 mm; Angle of lift 70 Degrees ; Calculate the principal dimensions of the cam and draw the cam profile.