KUMARAGURU
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Register Number: ……..

B.E DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Sixth Semester

AUTOMOBILE ENGINEERING

AUE 114 : Engine Design

(Use of PSG Design Data Book and Approved Design Data Books are permitted)

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. In compression ignition (CI) engine, the compression ratio is
   a) Cylinder volume / Clearance volume
   b) Swept Volume / Cylinder Volume
   c) Clearance volume / Cylinder volume
   d) Cylinder volume / Swept volume
2. The common firing order of a six cylinder engine is
   a) 1,5,3,2,6,4
   b) 1,5,3,6,2,4
   c) 1,3,5,6,2,4
   d) 1,2,3,4,5,6
3. The cylinders are usually made of
   a) cast iron or cast steel
   b) aluminium
   c) stainless steel
   d) copper
4. The length of the piston usually varies between
   a) D and 1.5 D
   b) 1.5 D and 2 D
   c) 2D and 2.5 D
   d) 2.5 D and 3 D
5. The crankshaft in an internal combustion engine
   a) is a disc which reciprocates in a cylinder
   b) is used to retain the working fluid and to guide the piston
   c) converts reciprocating motion of the piston into rotary motion and vice versa
   d) is a device which store the energy
6. The crankshaft has its one end as
   a) Piston
   b) Connecting rod
   c) Cam shaft
   d) Flywheel

7. Thermal conductivity of water _____ with rise in temperature.

a) may increase or decrease depending upon temperature
b) decreases
c) increases
d) remains same

8. A radiator cap is designed to

a) keep water from slashing out of the radiator
b) keep the cooling system operating at a specified pressure
c) last indefinitely
d) Keeping the velocity constant

9. In designing a rocker arm for operating the exhaust valve, the ratio of the length to the diameter of the fulcrum and roller pin is taken as

a) 1.25
b) 1.5
c) 1.75
d) 2

10. The cam follower generally used in automobile engines is

a) knife edge follower
b) flat faced follower
c) spherical faced follower
d) roller follower

PART B (10 x 2 = 20 Marks)

11. Define the term swept volume.
12. State the difference between CI & SI Engine
13. Write down the necessity of piston rings in an engine assembly
14. List out reasons for the piston failure in an engine
15. Give some of the suitable materials used for manufacturing of crank shaft
16. Differentiate between internal balancing and external balancing in crank shaft
17. What is the purpose of the fins in an air-cooled system?
18. Mention few applications of dry sump lubrication system
19. List out the materials used for manufacturing exhaust manifold and valve springs in an Automobile engine
20. Define the term pressure angle with respect to cam

PART C (5 x 14 = 70 Marks)

21. a) How will you determine the power of an automobile engine? Elaborate the engine selection criteria in detail

(OR)

b) (i) Explain the theoretical design procedure for designing an automobile engine. (10)

(ii) Mention the design consideration to be applied while designing an engine (4)

22. a) Design a cast iron piston for a single acting four stroke engine for the following data:

Cylinder bore = 100 mm ; Stroke = 125 mm ; Maximum gas pressure = 5 N/mm^2 ; Indicated mean effective pressure = 0.75 N/mm2 ; Mechanical efficiency = 80% ; Fuel consumption = 0.15 kg per brake power per hour; Higher calorific value of fuel = 42 × 103 kJ/kg ; Speed = 2000 r.p.m. Any other data required for the design may be assumed

(OR)

22 b) (i) Explain the various stresses induced in the connecting rod. (10)

(ii) Under what force, the big end bolts and caps are designed? (4)

23. a) Enumerate the procedure to be adopted for designing a crank shaft by assuming suitable data

(OR)

23 b) Explain the balancing of engine with respect to firing order and mechanical balance

24. a) (i) Explain the various types of engine cooling system in detail with suitable sketches (10)

(ii) Differentiate between air cooling system and water cooling system. (4)

(OR)

24 b) (i) Elaborate the dry sump lubrication system in detail (10)

(ii) Brief the types of lubricants used in an automobile (4)

25. a) Design a valve spring of a petrol engine for the following operating conditions :

Spring load when the valve is open = 400 N

Spring load when the valve is closed = 250 N

Maximum inside diameter of spring = 25 mm

Length of the spring when the valve is open = 40 mm

Length of the spring when the valve is closed = 50 mm

Maximum permissible shear stress = 400 MPa

(OR)

25 b) A cam is to be designed for a knife edge follower with the following data :

1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.
2. Dwell for the next 30°.
3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.
4. Dwell during the remaining 180°.

Draw the profile of the cam when

(a) the line of stroke of the follower passes through the axis of the cam shaft, and

(b) the line of stroke is offset 20 mm from the axis of the cam shaft.

The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.

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