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M.E. / M.TECH. DEGREE EXAMINATIONS, MAY/JUNE 2017
SECOND SEMESTER

INTERNAL COMBUSTION ENGINEERING
IC16202 – INTERNAL COMBUSTION ENGINE DESIGN

(Regulation 2016)

Q. Code: 186593

Time: Three Hours

Maximum : 100 Marks

Answer ALL questions

PART A - (10 X 2 = 20 Marks)

1. Define principle of similitude.
2. List out types of engine noises.
3. Discuss the material commonly used for making the valve of an I.C engine.
4. Explain the various types of cylinder liners.
5. What is the function of air fin?
6. Why supercharging is more preferred in C.I engines than S.I engines?
7. Why is piston deflector used in 2-S engine?
8. Define scavenging and types of scavenging system.
9. List out various objectives of working drawing.
10. Name the types of modelling software used in I.C engine design.

PART B - (5 X16 = 80 Marks)

11. (a) (i) Discuss on various similitudes generally used in model studies in I.C engines. (8)
(ii) Explain the selection criteria for piston material for S.I and C.I engines. (8)
(OR)
- (b) (i) Explain the causes of various noises occurring in an I.C engine. (8)
(ii) How to do fatigue analysis in crankshaft, connecting rod for the four stroke S.I engine? (8)
12. (a) Design a cast iron piston for a single acting four stroke engine for the following (16)
data: Cylinder bore = 100mm; Stroke = 125mm; Maximum gas pressure = 5N/mm²; Indicated mean effective pressure = 0.75N/mm²; Mechanical efficiency = 80%; Fuel Consumption = 0.15kg per brake power per hour; Higher calorific value of fuel = 42 x 10³kJ/kg; Speed = 2000rpm. Any data required for the design may be assumed.

(OR)

- (b) Design a plain carbon steel centre crankshaft for a single acting four stroke single cylinder engine for the following data: Bore = 400mm; Stroke = 600mm; Engine speed = 200rpm; Mean effective pressure = 0.5N/mm^2 ; Maximum combustion pressure = 2.5N/mm^2 ; Weight of the flywheel used as a pulley = 50kN; Total belt pull = 6.5kN. When the crank has turned through 35° from the top dead centre, the pressure on the piston is 1N/mm^2 and the torque on the crank is maximum. The ratio of the connecting rod length to the crank radius is 5. Assume any other data required for the design. **(16)**

13. (a) (i) Discuss the lubrication theory. Differentiate between the lubrication between the reciprocating surfaces and rotating surfaces. **(10)**
(ii) Describe the exhaust gas recirculation (EGR) device for the control of NO_x emission from S.I engine. **(6)**

(OR)

- (b) A four stroke engine has the following specifications: Brake power = 5kW; Speed = 1200rpm; indicated mean effective pressure = 0.35N/mm^2 ; Mechanical efficiency = 80%; Determine 1. Bore and length of the cylinder 2. Thickness of the cylinder head; and 3. Size of studs for the cylinder head. **(16)**

14. (a) (i) Describe the differences in valve timing on a naturally aspirated diesel engine, a turbocharged diesel engine and a high performance petrol engine. **(10)**
(ii) Explain the flow characteristics of poppet valves. **(6)**

(OR)

- (b) (i) A single cylinder 2-stroke petrol engine has 8cm diameter and 12cm stroke. The compression ratio is 7. The exhaust valve opens 60° before BDC and closes 60° after BDC. The A:F ratio supplied to the engine 15:1. The temperature of the mixture entering into the engine is 300K and the pressure in the cylinder at the time of closing exhaust port is 1.05bar. Find (a) Scavenging ratio (b) Scavenging efficiency. **(10)**
(ii) Explain any one of two stroke diesel engine in marine application. **(6)**

15. (a) Explain the design process of the four stroke diesel engine with flow chart. **(16)**

(OR)

- (b) Describe the step by step procedure for the development of cylinder head and intake manifold in CAD modelling. **(16)**