

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)

May 2018 End Semester Examinations
M.Tech. (Marine Engineering and Management)
Second Semester

Design of IC Engines (PG13T1201)

Date: 28-05-2018

Time: 3 Hrs

Maximum Marks : 100

Pass Marks : 50

Answer any **FIVE** questions.
Use of Design Data is permitted.

(5 x 20 = 100 Marks)

1. (a) What are the advantages of internal combustion engines over the external combustion engines? 5M
(b) Describe the operation of four stroke SI engine. 5M
(c) Explain the effect of ignition in constant volume cycle. 10M
[5+5+10=20]
2. (a) Explain the effect of variables that have impact on performance and emissions of SI and CI engines. 8M
(b) Deliberate the factors affecting flame speed during combustion in SI engines. 4M
(c) Elaborate the stages of combustion in SI engine, using actual p-θ diagram. 8M
[8+4+8=20]
3. (a) Describe the combustion stages of CI engine using heat release rate - crank angle diagram. 8M
(b) Identify the factors affecting ignition delay during combustion in CI engines. 6M
(c) Write short notes on knock in CI Engines. 6M
[8+6+6=20]

4. (a) What are the governing equations for an open thermodynamic system? 4M

(b) Interpret the second law analysis of engine processes. 6M

(c) Discover the steps used in computational methodology. 10M

[4+6+10=20]

5. Design a cast iron piston for a 4-stroke single acting engine from the following data:

Cylinder bore dia = 100 mm (D), Stroke length = 120 mm (L), Gas pressure = 5 MPa, BMEP = 0.5 MPa, Fuel consumption = 0.15 kg/BP(W), Speed = 2200 rpm. Calorific value of fuel is 42000 kJ/kg. Assume suitable data if not provided in the problem. 20M

6. a) Discuss the trends of load on bmep, efficiency and emissions in case of diesel engines. 10M

b) Discuss the design of IC engine components like connecting rod using a software package. 10M

[10+10=20]

7. (a) Find the diameter of a connecting rod of 250 mm long for a stroke speed diesel engine. Cylinder diameter is 100 cm = 1000 mm and stroke is 125 cm = 1250 mm. Maximum combustion pressure is 4.905 N/mm^2 , FOS = 20, $E = 2.06 \times 10^5 \text{ N/mm}^2$. 6M

(b) Brief the classification of engines. 8M

(c) Illustrate 'Filling and Emptying' model. 6M

[6+8+6=20]

8. (a) Describe the modes of heat transfer in an I.C engine. 8M

(b) Draw the types of DI and IDI injection chambers of CI Engines. 6M

(c) Sketch the block diagram of turbocharged turbo-compounded diesel engine system. 6M

[8+6+6=20]
