TED (10)–3045

(REVISION—2010)

Reg. No. .....

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FOURTH SEMESTER DIPLOMA EXAMINATION IN AUTOMOBILE ENGINEERING—MARCH, 2012

APPLIED THERMODYNAMICS

[*Time* : 3 hours

(Maximum marks : 100)

Marks

PART—A

I Answer *all* questions in one or two sentences. Each question carries 2 marks.

1. Sate the Zeroth law of thermodynamics.
2. What do you meant by Entropy ?
3. Define the term Air Standard Efficiency.
4. What is Brake power of an engine ?
5. Define conduction. (5x2=10)

PART—B

II Answer *any five* of the following questions. Each question carries 6 marks.

1. Derive the expression for work done and heat transfer during isothermal process.
2. 0.3 m^3 of air at 20° C and under atmospheric pressure is heated under constant volume to a temperature of 100° C. Assume Cp = 1 KJ/KgK and Cv = 0.71 KJ/KgK. Find : (a) The mass (b) Final pressure (c) Heat transfer.
3. State the assumption made for deriving the Air Standard Efficiency of Carnot, Otto and Diesel cycle.
4. Compare Otto and Diesel cycle.
5. What is Morse test ? Explain the method of conducting Morse test on a 4 cylinder S.I. engine.
6. Explain with a neat sketch Vane Blower type Air Compressor.
7. Explain the concept of black body. (5x6=30)

PART—C

(Answer *one* full question from each unit. Each question carries 15 marks.)

UNIT – I

III (a) Prove that Adiabatic process follow the law PV^{γ} = constant. 8

(b) 0.45 kg of gas occupies 0.35m^3 at 15° C and 110 kN/m^2 and after Adiabatic compression to 0.13 m^3, the pressure is 440 kN/m^2. Find Cp and Cv. 7

OR

Marks

IV (a) What do you meant by free expansion and throttling process ? 7

(b) Derive the expression for workdone and heat supplied during Polytropic process. 8

UNIT – II

V (a) Calculate the Air Standard Efficiency of an engine working on otto cycle, if the pressure at the beginning and end of the compression are 103 kN/m² and 820 kN/m² respectively, Take $\gamma = 1.4$. 7

(b) Sketch and explain the P.V diagram for Carnot cycle and find out its Air standard efficiency. 8

OR

VI (a) What will be the loss of thermal efficiency of a diesel engine with a compression ratio of 14, if the cut-off ratio is delayed from 5% to 7% of the stroke ? 8

(b) Derive the expression for air standard efficiency of Otto cycle. 7

UNIT – III

VII (a) Explain with a neat sketch, working of centrifugal compressor. 9

(b) During a test on a four stroke cycle engine the following data were obtained :
Swept volume = 14 litres, Speed = 6.5 rps, Effective brake load = 75 kg, Effective brake radius = 0.7 m.
Indicated mean effective pressure = 560 kN/m². Find indicated brake power and mechanical efficiency. 6

OR

VIII A single cylinder engine working on a 4-stroke cycle has bore of 100 mm and stroke 120 mm and runs at 10 rps. The mean effective pressure is 700 kN/m². It uses 1.15 kg of fuel per hour having a calorific value of 44500 kJ/Kg. The cylinder jacket cooling water enters at a temperature of 20°C and leaves 60°C, the quantity of water being 95 kg per hour. The brake wheel diameter is 850 mm and rope diameter is 20 mm. The net load on the brake is 110 N. Calculate : (i) Indicated power (ii) Brake power (iii) Mechanical efficiency. (iv) Draw up heat balance sheet on minute basis assuming that 6% of heat supplied is lost unaccounted.
Specific heat of water 4.1868 kJ/kgK. (3x2=6 + 9 =15)

UNIT – IV

IX (a) Derive the equation for conductive heat flow through a composite wall. 7

(b) Define : (i) Opaque body (ii) Absolute transparent body (iii) White body (iv) Gray body. (4x2=8)

OR

X (a) Explain direct contact, regenerator and recuperator type heat exchanger. 9

(b) Explain LMTD for parallel flow and counter flow heat exchanger. 6