

**B.Tech. AEROSPACE ENGINEERING
(BTAE)**

Term-End Examination

June, 2016

00248

BAS-013 : PROPULSION – I

Time : 3 hours

Maximum Marks : 70

Note : *Section I is compulsory. Attempt any nine questions from Section II. Use of scientific calculator is permitted.*

SECTION I

1. (a) Answer *true* or *false*. 3×1=3
- (i) For same maximum pressure and temperature, the efficiency of Diesel cycle is less than that of Dual and Otto cycles.
 - (ii) For minimum heat loss, the outer radius of insulation should be more than the critical radius of insulation.
 - (iii) In mist lubrication, 2 to 3% lubricating oil is added to the fuel.

(b) Fill in the blanks.

4×1=4

- (i) In a four-stroke engine, the exhaust valve opens before BDC to reduce the work required to _____ exhaust gases.
- (ii) Brake power + _____ = Indicated power
- (iii) No-load running of an engine is called _____.
- (iv) Volumetric efficiency is the ratio of _____ to swept volume.

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SECTION II

Attempt any *nine* questions.

2. Explain the physical significance of mean effective pressure and specific fuel consumption. 7
3. Compression ratio of an air standard Diesel cycle is 15. Pressure and temperature at inlet to isentropic compression are 25°C and 0.1 MPa , respectively. Heat is added at constant pressure till the temperature reaches 1500°C . Calculate the (a) cut-off ratio (b) heat supplied per kg of air (c) cycle efficiency, and (d) network. Assume c_v and c_p as $1.005\text{ kJ/kg }^{\circ}\text{K}$ and $0.72\text{ kJ/kg }^{\circ}\text{K}$ and $\gamma = 0.4$. 7
4. Analyse the performance of propulsion system in terms of specific thrust, propulsive efficiency and thermal efficiency. 7
5. With the help of $p-\theta$ diagram, discuss the combustion process in C.I. engines. Also show the stages of combustion. 7
6. A two-stroke engine delivers 6000 kW while using 1500 kW to overcome frictional losses. It consumes 2400 kg of fuel per hour at an air-fuel ratio of $18:1$. The heating value of fuel is 43000 kJ/kg . Find the (a) indicated power, (b) mechanical efficiency, (c) air consumption per hour, (d) indicated thermal efficiency, and (e) brake thermal efficiency. 7

7. Explain in brief about the ignition system used in an aircraft's S.I. engine. 7
 8. The walls of a room are made of brick outside, wood inside and plastic foam in the middle. The thickness of each is 0.25 m, 2 cm and 10 cm, respectively. The inside and outside convective heat transfer coefficients are $30 \text{ W/m}^2\text{-K}$ and $15 \text{ W/m}^2\text{-K}$ and thermal conductivities of brick, foam and wood are 0.1 W/m-K , 0.02 W/m-K and 0.18 W/m-K , respectively. The outside and inside temperatures of the room are 25°C and -5°C , respectively. Determine the rate of heat removal by refrigeration system, if total wall area is 100 m^2 and also determine the inside temperature of the brick surface. 7
 9. Derive the expression for heat transfer by natural convection from a heated vertical flat plate. 7
 10. With a neat sketch, discuss the construction and working of a simple carburettor. 7
 11. Explain splash lubrication system. Also mention its merits and demerits. 7
 12. Explain the engine performance test keeping the speed of engine constant. 7
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