No. of Printed Pages : 3

BAS-016

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00358

June, 2015

BAS-016 : PROPULSION – II

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Use of scientific calculator is permitted. Use of Steam table and Mollier chart is allowed.*

1. (a) Differentiate between an impulse and a reaction turbine. Explain the working of an impulse and a reaction stage with the help of neat sketches. *7*

(b) Define nozzle efficiency. Derive the expression for frictionally resisted expansion. *7*

2. (a) State the fundamental difference between the turbo-jet engine and turbo-prop engine. *6*

(b) Derive an expression for work done per stage of an axial flow turbine. *8*

3. (a) Discuss the factors that affect combustion chamber performance. *7*

(b) Explain blade and stage efficiency. Derive an expression for blade efficiency. *7*

4. (a) Discuss the aero dynamic design process of axial flow compressor. 7

(b) Differentiate between a nozzle and a diffuser. What is a shock ? Where does it occur in a nozzle ? 7

5. An axial flow turbine stage develops 3·36 MW at a mass flow rate of 27·2 kg/s. At the stage entry the stagnation pressure and temperature are 772 kPa and 727°C, respectively. The static pressure at exit from the nozzle is 482 kPa and the corresponding absolute flow direction is 72° to the axial direction. Assuming the axial velocity is constant across the stage and the gas enters and leaves the stage without any absolute swirl velocity, determine 14

(a) the nozzle exit velocity;

(b) the blade speed;

(c) the total-to-static efficiency; and

(d) the stage reaction.

6. Air at 1 bar and 288 K enters an axial flow compressor stage with an axial velocity of 150 m/s. There are no inlet guide vanes. The rotor has a tip diameter of 60 cm and a hub diameter of 50 cm and rotates at 100 rps. The air enters the rotor and leaves the stator with no change in velocity or radius. The air is turned through 30° as it passes through the rotor. Determine 14

(a) the blade angles,

(b) mass flow rate,

(c) power required and

(d) the degree of reaction.

7. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Flame stability

(b) Cascade action

(c) Blade cooling

(d) Nozzle coefficient

(e) Air fuel ratio

(f) After burner