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BAS-016

B.Tech. AEROSPACE ENGINEERING (BTAE)

Term-End Examination

00393

December, 2018

BAS-016 : PROPULSION – II

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted.*

1. Explain the working of a de Laval nozzle with the help of neat diagram and explain the effect of back pressures, area ratio and mass flow. *4+6=10*

2. Define the following terms : *5×2=10*
   (a) Flow coefficient
   (b) Stage loading
   (c) Diffusion factor
   (d) Loss coefficient
   (e) Degree of reaction

3. Differentiate between turbojet and turbofan engines. Explain the working of a turbofan engine with the help of a neat and labelled diagram. Also derive thrust equation for turbofan engine. *4+4+2*

4. (a) Explain the phenomenon of flame stability.
   (b) Explain the importance of afterburner.
   (c) Write a short note on ignition system. *3+3+4*

5. Differentiate between axial flow compressor and axial flow turbine. Draw and explain velocity diagram for a stage for axial flow compressor and turbine. *4+6*

6. Write short notes on the following : *2×5=10*
   (a) Ramjet Engine
   (b) Blade Cooling

7. Explain the following axial flow turbine stage parameters and explain their physical significance : *5×2=10*
   (a) Blade spacing
   (b) Velocity ratio
   (c) Radial variation
   (d) Temperature ratio
   (e) Degree of reaction

8. (a) The following data refers to the eye of a single-sided impeller.

Inner radius = 6·5 cm

Mass flow = 8 kg/s

Outer radius = 15 cm

Speed = 270 rev/s

Ambient conditions = 1 bar, 288 K

Assuming no pre-whirl and no losses in the intake duct, calculate the blade inlet angle at root and tip of the eye and Mach number at the tip of the eye.

(b) Explain the phenomenon of centrifugal compressor surge. *5+5*

9. An axial flow compressor stage has blade root, mean and tip velocities of 150 m/s, 200 m/s and 250 m/s respectively. The stage is to be designed for a stagnation temperature rise of 20 K and an axial velocity of 150 m/s, both constant from root to tip. The work done factor is 0·93. Assuming 50 percent reaction at mean radius, calculate the stage air angles at root, mean and tip and degree of reaction at root and tip for a free vortex design. *10*