Code No: R05312105 **R05** **Set No. 2**

III B.Tech I Semester Examinations,November 2010
AEROSPACE PROPULSION-I
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define and explain the significance of the following terms with respect to nozzles:
   i. Angularity coefficient
   ii. Gross thrust coefficient
   iii. Discharge or flow coefficient
   iv. Velocity coefficient
   (b) Write a note on 'nozzle performance'. [16]

2. How does the gas turbine working principle and design configurations differ for power generation and aviation applications. [16]

3. Write notes on the following:
   (a) Axial compressor characteristics.
   (b) Compressibility effects in axial flow compressors. [16]

4. The following data refers to a single-sided centrifugal compressor:

Impeller tip speed	= 455.5m/s
Stagnation temperature rise	= 193K
Pressure ratio	= 4.23
Eye tip diameter	= 0.3m
Eye root diameter	= 0.15m
Slip factor	= 0.9
Inlet stagnation temperature	= 295K
Inlet stagnation pressure	= 1.1bar
Air mass flow	= 9kg/s

   Assume the velocity of air at inlet to be axial.
   (a) Calculate the inlet angle of the impeller vane at the root and tip radii of the eye assuming that the axial inlet velocity is constant across the eye annulus.
   (b) Estimate the axial depth of the impeller channel at the periphery of the impeller. [16]

5. Why duplex burner is preferred over simplex burner? Explain the working of a duplex burner with the help of a neat sketch. [16]

6. Consider Ear type air intakes for a subsonic airplane as that for Gnat / Ajit fighter plane. Show the internal layout for the swallowed air to reach the engine. Explain

its aerodynamics and thermodynamics in details when the airplane climbs in its flight at higher angles. [16]

7. Plot P-v and T-s plots for a turbo-jet and turbo-prop engines. Explain the functioning and thermodynamics of a turbojet engine and plot the variation of pressure, temperature and velocity in as best manner as you can. [16]

8. Explain the aerodynamics and thermodynamics of an internal compression supersonic air inlet. Provide one example of such supersonic inlet. [16]

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Code No: R05312105 **R05** **Set No. 4**

III B.Tech I Semester Examinations,November 2010
AEROSPACE PROPULSION-I
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Why duplex burner is preferred over simplex burner? Explain the working of a duplex burner with the help of a neat sketch. [16]

2. (a) Define and explain the significance of the following terms with respect to nozzles:
   i. Angularity coefficient
   ii. Gross thrust coefficient
   iii. Discharge or flow coefficient
   iv. Velocity coefficient
   (b) Write a note on 'nozzle performance'. [16]

3. Plot P-v and T-s plots for a turbo-jet and turbo-prop engines. Explain the functioning and thermodynamics of a turbojet engine and plot the variation of pressure, temperature and velocity in as best manner as you can. [16]

4. Write notes on the following:
   (a) Axial compressor characteristics.
   (b) Compressibility effects in axial flow compressors. [16]

5. How does the gas turbine working principle and design configurations differ for power generation and aviation applications. [16]

6. The following data refers to a single-sided centrifugal compressor:

Impeller tip speed	= 455.5m/s
Stagnation temperature rise	= 193K
Pressure ratio	= 4.23
Eye tip diameter	= 0.3m
Eye root diameter	= 0.15m
Slip factor	= 0.9
Inlet stagnation temperature	= 295K
Inlet stagnation pressure	= 1.1bar
Air mass flow	= 9kg/s

   Assume the velocity of air at inlet to be axial.
   (a) Calculate the inlet angle of the impeller vane at the root and tip radii of the eye assuming that the axial inlet velocity is constant across the eye annulus.

(b) Estimate the axial depth of the impeller channel at the periphery of the impeller. [16]

7. Explain the aerodynamics and thermodynamics of an internal compression supersonic air inlet. Provide one example of such supersonic inlet. [16]

8. Consider Ear type air intakes for a subsonic airplane as that for Gnat / Ajit fighter plane. Show the internal layout for the swallowed air to reach the engine. Explain its aerodynamics and thermodynamics in details when the airplane climbs in its flight at higher angles. [16]

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Code No: R05312105 **R05** **Set No. 1**

III B.Tech I Semester Examinations,November 2010
AEROSPACE PROPULSION-I
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Why duplex burner is preferred over simplex burner? Explain the working of a duplex burner with the help of a neat sketch. [16]

2. (a) Define and explain the significance of the following terms with respect to nozzles:
   i. Angularity coefficient
   ii. Gross thrust coefficient
   iii. Discharge or flow coefficient
   iv. Velocity coefficient
   (b) Write a note on 'nozzle performance'. [16]

3. Write notes on the following:
   (a) Axial compressor characteristics.
   (b) Compressibility effects in axial flow compressors. [16]

4. Plot P-v and T-s plots for a turbo-jet and turbo-prop engines. Explain the functioning and thermodynamics of a turbojet engine and plot the variation of pressure, temperature and velocity in as best manner as you can. [16]

5. Explain the aerodynamics and thermodynamics of an internal compression supersonic air inlet. Provide one example of such supersonic inlet. [16]

6. The following data refers to a single-sided centrifugal compressor:

Impeller tip speed	= 455.5m/s
Stagnation temperature rise	= 193K
Pressure ratio	= 4.23
Eye tip diameter	= 0.3m
Eye root diameter	= 0.15m
Slip factor	= 0.9
Inlet stagnation temperature	= 295K
Inlet stagnation pressure	= 1.1bar
Air mass flow	= 9kg/s

   Assume the velocity of air at inlet to be axial.
   (a) Calculate the inlet angle of the impeller vane at the root and tip radii of the eye assuming that the axial inlet velocity is constant across the eye annulus.

(b) Estimate the axial depth of the impeller channel at the periphery of the impeller. [16]

7. How does the gas turbine working principle and design configurations differ for power generation and aviation applications. [16]

8. Consider Ear type air intakes for a subsonic airplane as that for Gnat / Ajit fighter plane. Show the internal layout for the swallowed air to reach the engine. Explain its aerodynamics and thermodynamics in details when the airplane climbs in its flight at higher angles. [16]

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Code No: R05312105 **R05** **Set No. 3**

III B.Tech I Semester Examinations,November 2010
AEROSPACE PROPULSION-I
Aeronautical Engineering

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Consider Ear type air intakes for a subsonic airplane as that for Gnat / Ajit fighter plane. Show the internal layout for the swallowed air to reach the engine. Explain its aerodynamics and thermodynamics in details when the airplane climbs in its flight at higher angles. [16]

2. How does the gas turbine working principle and design configurations differ for power generation and aviation applications. [16]

3. The following data refers to a single-sided centrifugal compressor:
   Impeller tip speed = 455.5m/s
   Stagnation temperature rise = 193K
   Pressure ratio = 4.23
   Eye tip diameter = 0.3m
   Eye root diameter = 0.15m
   Slip factor = 0.9
   Inlet stagnation temperature = 295K
   Inlet stagnation pressure = 1.1bar
   Air mass flow = 9kg/s
   Assume the velocity of air at inlet to be axial.
   (a) Calculate the inlet angle of the impeller vane at the root and tip radii of the eye assuming that the axial inlet velocity is constant across the eye annulus.
   (b) Estimate the axial depth of the impeller channel at the periphery of the impeller. [16]

4. Explain the aerodynamics and thermodynamics of an internal compression supersonic air inlet. Provide one example of such supersonic inlet. [16]

5. Write notes on the following:
   (a) Axial compressor characteristics.
   (b) Compressibility effects in axial flow compressors. [16]

6. Why duplex burner is preferred over simplex burner? Explain the working of a duplex burner with the help of a neat sketch. [16]

7. Plot P-v and T-s plots for a turbo-jet and turbo-prop engines. Explain the functioning and thermodynamics of a turbojet engine and plot the variation of pressure, temperature and velocity in as best manner as you can. [16]

8. (a) Define and explain the significance of the following terms with respect to nozzles:
   i. Angularity coefficient
   ii. Gross thrust coefficient
   iii. Discharge or flow coefficient
   iv. Velocity coefficient

   (b) Write a note on 'nozzle performance'. [16]

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