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Total No. of Questions : 09

B.Tech.(ANE) (Sem.-4)
AIRCRAFT PROPULSION – I
Subject Code : ANE-208
Paper ID : [A1034]

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1) Answer briefly :

- a) Mention the assumptions made across an actuator disc in Ideal momentum theory.
- b) Define Activity Factor & Advance Ratio.
- c) Define BHP & SHP. Which is greater?
- d) What is the reason to consider 2 stroke SI engine as an OTTO cycle?
- e) How supercharging differs from Turbocharging?
- f) Among turbocharger and Supercharger, which has a quicker response to engine power demand and why?
- g) State Fourier's law of conduction.
- h) How is an air-standard diesel cycle differing from Brayton cycle even though both have isobaric heat addition process?
- i) What is the purpose of stator blades behind rotor in turbo-compressors?
- j) Plank's distributive law.

SECTION-B

- 2) Obtain the advance ration and power coefficient of a propeller designed for cruise condition of 103 m/s at 3 Km altitude. The engine power available is 877 Kw at 1105 RPM. The blade is efficient between $\frac{J}{C_p^{\frac{1}{3}}}$ of 2.4 and 3.2. However, $\frac{J}{C_p^{\frac{1}{3}}}$ of 2.6 is selected for the design. Note: Ambient density at 3 Km altitude is 0.909.
- 3) Describe the effect of altitude on power required and power required of a piston propeller engine with neat graph.
- 4) Neatly draw the layout of the engines and explain how Turbo-shaft, turbo-fan and turbo-prop differ from each other.
- 5) Obtain thrust equation for a single engine aircraft.
- 6) Obtain ID heat conduction equation for a homogeneous solid material. Note: state all the assumptions you make in the process clearly.

SECTION-C

- 7) Obtain a relation for power required at the actuator disc as per ideal momentum theory. Note : clearly state the assumptions.
- 8) Explain the working of a 4-stroke diesel engine with a neat diagram and obtain expression for power output of an engine operating at 'N' RPM.
- 9) For each component of a simple turbo-jet engine, neatly draw the thermodynamic process in a T-S diagram and obtain the expression for component efficiency. Note : there are 5 primary components for a simple turbo-jet engine.