Register Number: ……..

B.E DEGREE EXAMINATIONS: APRIL/MAY 2014

(Regulation 2009)

Sixth Semester

AERONAUTICAL ENGINEERING

AER117**:** Wind Tunnel Techniques

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The dimension of power in MLT system is
   a) ML^2T^{-3} b) $ML^{-2}T^{-2}$
   c) ML^3T^{-3} d) ML^2T^{-2}
2. The square root of inertia force to surface tension force is known as
   a) Euler number b) Froude number
   c) Weber number d) Reynolds' number
3. The open circuit tunnel with open test section is termed as
   a) NPL tunnel b) Gottingen tunnel
   c) Eiffel tunnel d) Non-return tunnel
4. Find out the odd one out from the following
   a) Spin tunnel b) Propeller tunnel
   c) Stability tunnel d) Climatic tunnel
5. Pitot-static tube measures
   a) Static pressure b) Total pressure and static pressure
   c) Dynamic pressure d) Total pressure
6. Turbulence sphere is used to measure
   a) Pressure b) Temperature
   c) Density d) Turbulence
7. Which one of the following is not an optical flow visualization technique?
   a) Shadow graph method b) Schlieren method
   c) Laser Doppler anemometry d) Gas bubble technique
8. The forces and moments that can be measured using 3 component balances are
   a) Lift, Drag and Yawing b) Lift, Drag and Rolling
   c) Lift, Drag and Pitching d) Lift, Drag and Side force
9. Diaphragm is used in
   a) Shock tubes b) Induction tunnel
   c) Blow down tunnel d) Indraft tunnel
10. Open test section is provided in
    a) Hypersonic tunnel b) Supersonic tunnel
    c) Helium tunnel d) Transonic tunnel

PART B (10 x 2 = 20 Marks)

11. State Buckingham's π theorem.
12. What are the factors influencing hydraulic phenomena?
13. Classify the wind tunnels based on speed regime.
14. Define energy ratio.
15. Define turbulence factor.
16. What is the need of calibration rakes?
17. What are the six component forces and moments?
18. Name any three non-optical flow visualization techniques.
19. Mention the types of intermittent tunnels.
20. What are the main components of blowdown tunnel?

PART C (5 x 14 = 70 Marks)

21. a) (i) Write in detail about model analysis, its advantages and application of model testing. (7)

    (ii) Give an account of scale effects in models and limitation of hydraulic similitude. (7)

    (OR)

    b) The efficiency **η** of a fan depends on density **ρ**, dynamic viscosity **μ** of the fluid, angular velocity **ω**, diameter **D** of the rotor and the discharge **Q**. Express **η** in terms of dimensionless parameters.

22. a) Draw the layout of closed circuit single return wind tunnel and explain its features.

    (OR)

    b) Classify the wind tunnels based on speed require and discuss the manufactures / problems of each one."

23. a) (i) Explain briefly about calibration of supersonic tunnel. (7)

(ii) With the help of neat labeled sketch, explain about Mach number distribution and turbulence measurement in subsonic tunnel calibration. (7)

(OR)

b) Bring out the main features of yawmeters and types with neat sketches.".

24. a) (i) Explain the construction and working of wire balance with neat labeled sketch. (7)

(ii) Write short notes on Platform, Yoke and Pyramidal balances. (7)

(OR)

b) With neat sketches, explain the main features of particle image Velocimetry.

25. a) (i) Discuss the following optical methods of flow visualization with neat sketches, Schlieren System (7)

(ii) Shadowgraph method (7)

(OR)

b) Write in detail about the design features and peculiarities of transonic tunnel.

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