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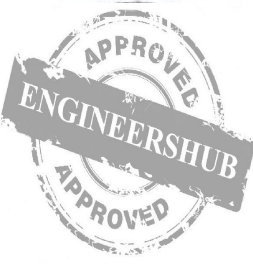
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech IV Year II Semester Examinations, May - 2013

Wind Engineering and Industrial Aerodynamics
(Aeronautical Engineering)

Time: 3 Hours

Max. M

Answer any Five Questions
All Questions Carry Equal Marks

- 1.a) How are pressure gradients generated in the atmosphere and what is their effect on wind? [7+8]
- b) Define Coriolis acceleration. What is the effect of Coriolis acceleration on atmosphere? Explain the relevant physics and mathematics. [7+8]
2. What is a wind tunnel? What type of wind tunnel is needed to study the effect of atmospheric wind on a stationary body? How do you create atmospheric boundary layer type wind in a wind tunnel? What are the effects that you can study in such a tunnel? [15]
- 3.a) List out the aerodynamic forces acting on a yacht and explain how a dynamically stable movement of the yacht can be ensured? Explain with the help of all the governing equations.
- b) Describe a vertical axis wind turbine and explain how it generates motion. Explain the physics, deriving the necessary mathematical equations. [7+8]
4. Following the blade element theory approach, derive an expression for the power coefficient of a wind mill. [15]
5. Consider a racing car configuration. Calculate its power requirement at 100 km per hour steady speed, if the mass of the vehicle including the driver and fuel is 1200 kg. Assume a ground friction coefficient of 0.22. Do not ignore the aerodynamic force. Assume reasonable values for the other parameters needed for the calculation, if any. [15]
6. Explain the loads generated on a tall building by ground winds, (i) assuming the building is standing alone in an open area and (ii) assuming that it is in a row of building, all buildings being in close proximity, but not contiguous. [15]
7. Write short notes on
i) Wake flow,
ii) Effect of Reynolds number on the wind loads on a building,
iii) Stall flutter.
8. Explain the phenomena of low wind and high wind. How do you categorize an atmospheric wind as low or high? Explain the phenomena of plume rise in the two cases of low and high winds. [15]

