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10MR45

# Fourth Semester B.E. Degree Examination, June/July 2015
## Marine Heat Engine and Air-Conditioning

Time: 3 hrs. Max. Marks:100

**Note:** ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***



### PART – A

1 a. Explain working principle of impulse turbine and draw velocity compounding of impulse turbine. **(10 Marks)**

b. A steam jet enters the row of blades with velocity of 375 m/s at an angle of 20° with direction of motion of the moving blades, if the blade speed is 165 m/s, find the suitable inlet and outlet blade angles assuming that there is no thrust on blades, the velocity of steam passing. Over the blades is reduced by 15%, also determine power developed by the turbine per kg of steam flowing over the blades per second. **(10 Marks)**

2 a. Draw and describe Parson's Reaction Turbine. Also draw velocity diagram for Parson's Reaction Turbine. **(10 Marks)**

b. A Parson's turbine runs at 400rpm with 50% reaction and it develops 75kW of power per unit mass of steam flow per second. The exit angle of blade is 20° and the steam velocity is 1.4 times the blade velocity, find: i) Blade velocity; ii) Inlet angle of blade. **(10 Marks)**

3 a. Derive efficiency of Rankine cycle in terms of temperature and latent heat at supply pressure. **(10 Marks)**

b. In a steam power plant operating on ideal Rankine cycle, steam enters the turbine at 20-bar with an enthalpy of 3248 kJ/kg and an entropy of 7.127 kJ/kg K the condenser pressure is 0.1 bar. Find Rankine efficiency and specific steam consumption in kg/kw hr. Do not neglect pump work. **(10 Marks)**

4 a. Derive binary vapour cycle and its effect on thermal efficiency. **(12 Marks)**

b. Explain about combined steam and gas plant. **(08 Marks)**

### PART – B

5 a. Write down merits and demerits of gas turbine plants. **(08 Marks)**

b. Explain with a sketch constant volume or explosion cycle gas turbine plant. **(12 Marks)**

6 a. Explain working principle of centrifugal compression. **(08 Marks)**

b. Sketch and describe multi-stage centrifugal compressor. **(12 Marks)**

7 a. Sketch a marine refrigerant plant and describe briefly any four important factors involved in this process. **(12 Marks)**

b. Explain process refrigeration in liquefied gas carriers. **(08 Marks)**

8 a. Explain with a neat sketch principle of air conditioning. **(14 Marks)**

b. Write down psychometric properties of air-comfort conditions. **(06 Marks)**

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