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Code No. : 21205

VASAVI COLLEGE OF ENGINEERING (*Autonomous*), HYDERABAD
B.E. II Year (E.E.E.) I-Semester (Main) Examinations, December - 2015

Principles of Mechanical Engineering

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE questions from Part-B

Part-A ($10 \times 2 = 20$ Marks)

1. Give the main classification of heat exchangers.
2. Write the important applications of air refrigeration system.
3. Distinguish between fire-tube and water tube boilers.
4. Sketch different thermodynamic processes in gas turbine cycle on P-V and T-S plane.
5. State the difference between compound and epi-cyclic gear train.
6. Give the classification of gears.
7. Define the specific speed of a hydraulic turbine.
8. Write the practical applications of Bernoulli's equations.
9. Define manometric head.
10. Give the functions of air vessels in reciprocating pump.

Part-A ($5 \times 10 = 50$ Marks)

11. a) Draw the T-s and P-h Diagrams of vapour compression refrigeration cycle with dry saturated vapour at the beginning of compression. [3]
b) Determine steady state heat transfer per unit area through a 10 cm brick wall ($k=0.69\text{W/m}^0\text{C}$) which has temperatures of 105^0C and 10^0C maintained on its two faces. How this heat transfer would vary if each 3 cm thick layer of magnesia ($k=0.113\text{W/m}^0\text{C}$) is added on both sides of brick wall. Also determine the interface temperatures. [7]
12. a) Explain the working of locomotive boiler with the help of a neat diagram. [5]
b) A two stroke cycle internal combustion engine has a mean effective pressure of 6 bar. The speed of the engine is 1000 rpm. Calculate the indicated power if the diameter of the piston 110 mm and the stroke 140 mm. [5]
13. a) Derive expression for power transmitted by the belt. [3]
b) Find the power transmitted by a belt running over a pulley of 600 mm diameter at 200 rpm. The coefficient of friction between the belt and pulley is 0.25, angle of lap 160^0 and maximum tension in the belt is 2500 N. [7]
14. a) Write the Darcy's formula, state its application and explain all the parameters with their respective units. [3]
b) Calculate the discharge through a pipe of diameter 200 mm when the difference of pressure head between two ends of a pipe 500 m apart is 4 m of water. Take the value of coefficient of friction $f=0.009$. [7]

15. a) Define cavitation. What are the effects of cavitation? Give the necessary precautions against cavitation. [5]
- b) A single acting reciprocating pump has the plunger diameter 20 cm and stroke of 30 cm. The pump discharges 0.53 m^3 of water per minute at 60 rpm. Find the theoretical discharge and power required to run the pump if the suction and delivery heads are 4 m and 12 m respectively. [5]
16. a) Exhaust gases flowing through a tubular heat exchanger are cooled from 400°C to 120°C . The cooling is affected by water that enters the system at 10°C and leaves the heat exchanger at 70°C . Calculate Log Mean Temperature Difference (LMTD) for i) parallel flow arrangement and ii) counter flow arrangement. [6]
- b) Compare single stage reciprocating air compressors with multi stage air compressors. [4]
17. Write short notes on any *two* of the following:
- a) Inverted gear trains [5]
- b) Draft tubes used in reaction turbines [5]
- c) Working principle of centrifugal pump. [5]

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