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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. II Year (E.E.E.) I-Semester Supplementary Examinations, May/June-2017

Principles of Mechanical Engineering

Time: 3 hours Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1. Write the Fourier law of heat conduction formula and give the units of various quantities involved.
2. Show the simple vapour compression refrigeration cycle on T-s diagram and name the processes.
3. Draw the P-v diagram of an I C engine working on Otto cycle; also mention the various thermodynamic processes of the cycle.
4. What do you mean by multistage compression? State its advantages.
5. The power is transmitted from a pulley of 1 m diameter running at 200 r.p.m. to a pulley 2.25 m diameter by means of a belt. Find the speed of the driven pulley.
6. Compare belt drives with gear drives.
7. State Bernoulli's theorem.
8. Define Reynold's number and state its signifance.
9. List the main parts of reciprocating pump.
10. Give the functions of air vessels in reciprocating pump.

Part-B (5 × 10 = 50 Marks)

11. a) Explain the difference between LMTD of parallel flow and counter flow heat exchanger. [4]

    b) A 150 mm steam pipe has inside diameter of 120 mm and outside diameter of 160 mm. It is insulated at the outside with asbestos. The steam temperature is 150°C and the air temperature is 20°C. h (steam side) = 100 W/m^2 °C, h (air side) = 30 W/m^2 °C, k (asbestos) = 0.8 W/m°C and k (steel) = 42 W/m°C. How thick should the asbestos be provided in order to limit the heat losses to 2.1 kW/m^2 ? [6]

12. a) Explain the terms mean effective pressure, mechanical efficiency and thermal efficiency in the case of internal combustion engines. [5]

    b) Explain the working of simple gas turbine and state its applications. [5]

13. a) Explain briefly the differences between simple, compound, and epi-cyclic gear trains. What are the advantages of epi-cyclic gear trains? [5]

    b) Two parallel shafts 5 m apart are provided with 600 mm and 400 mm diameter pulleys which are connected by a cross belt drive. It is desired to reverse the direction of rotation of the driven pulley by changing over to an open belt drive. Calculate the reduction in the length of the belt required. [5]

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14. a) Explain the principle of Orificemeter with a neat sketch. [4]

b) A turbine with an overall efficiency of 90% is to be installed in a hydroelectric plant. The head and discharge available at the plant are 30 m and 15 cubic meters per second respectively. If the turbine has to run at 150 r.p.m., determine the power developed, specific speed and type of turbine. [6]

15. a) Explain the construction details of double acting reciprocating pump with the help of neat sketch. [4]

b) A single acting reciprocating pump has a bore of 250 mm and a stroke of 400 mm and runs at 30 rpm. The suction head is 7 m and the delivery head is 15 m. It discharges water at the rate of 0.009 cubic meters per second. Determine (i) the theoretical discharge, (ii) the slip, (iii) the percentage slip, (iv) the coefficient of discharge, and (v) the theoretical power required to drive the pump. [6]

16. a) What are the desirable properties of an ideal refrigerant? [4]

b) Describe with a neat sketch the construction and working of single stage single acting reciprocating air compressor with clearance. [6]

17. Write short notes on any **two** of the following:

a) Gear trains. [5]

b) Draft tube [5]

c) Priming of a centrifugal pump [5]

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