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Code No. : 13308 O

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**

**B.E. (EEE) II Year I-Semester Backlog Examinations, December-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 × 2 = 20 Marks)**

1. Define thermal conductivity of a material. What are its units?
2. Write any four industrial applications of heat exchangers.
3. Define thermal and mechanical efficiencies of an Internal Combustion engine.
4. Mention any four advantages of multi-stage compression of air.
5. Indicate some merits and demerits of belt drives.
6. What are the applications of gear drive?
7. Define Reynold's number.
8. List and sketch different draft tubes used in Francis turbines.
9. Write the classification of pumps.
10. Compare reciprocating pumps with centrifugal pumps (List any four points).

**Part-B (5 × 10 = 50 Marks)**

11. a) Discuss the different modes of heat transfer and mention two applications in each case. [6]  
b) The wall of a house in cold region comprises three layers: 15 cm outer brick work ( $k = 0.75\text{W/m K}$ ), 1.25 cm inner wooden paneling ( $k = 0.2\text{W/m K}$ ) and 7.5 cm intermediate layer of insulating material with thermal resistance is twice the thermal resistance of brick work. If the inside and outside temperatures of the composite wall are  $20^{\circ}\text{C}$  and  $-15^{\circ}\text{C}$  respectively, Determine the thermal conductivity of the insulating material and the rate of heat loss per unit area of the wall. [4]
12. a) Explain the working of a four stroke petrol engine with a sketch and P-v diagram. [5]  
b) Describe with the help of a neat sketch the working of Cochran boiler. [5]
13. a) Illustrate the working of a compound gear train with the help of neat sketch. [5]  
b) A belt is running over a pulley of diameter 120 cm at 200rpm. The angle of contact is  $165^{\circ}$  and co-efficient of friction between the belt and pulley is 0.3. If the maximum tension in the belt is 3000 N, Estimate the power transmitted by the belt. [5]
14. a) Explain the working of Venturimeter with a sketch and mention its applications. [5]  
b) A turbine is to operate under a head of 25 m at 200 rpm. The discharge is 9 cubic meters per second. If the overall efficiency of the turbine is 90%. Determine the Power developed by the turbine. [5]
15. a) Describe the working of centrifugal pump with a sketch. [4]  
b) A single acting reciprocating pump, running at 50rpm delivers  $0.01\text{ m}^3/\text{s}$  of water. The diameter of the piston is 200 mm and stroke length is 400 mm. Determine: (i) The theoretical discharge of the pump, (ii) Co-efficient of discharge, and (iii) slip and percentage slip of the pump. [6]

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- 16. a) Describe the working of Bell coleman refrigeration system with a line diagram. [5]
- b) A 4-cylinder 2-stroke cycle petrol engine develops 30 kW at 2500 rpm. The mean effective pressure on each piston is 8 bar and mechanical efficiency is 80%. Calculate the diameter and stroke of each cylinder if the stroke to bore ratio is 1.5. [5]
- 17. Answer any **two** of the following:

  - a) Describe the working of epi-cyclic gear train with a neat sketch. [5]
  - b) Explain the working of a Pelton turbine with the help of a neat sketch. [5]
  - c) Describe the working of single acting reciprocating pump with a sketch. [5]

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- 12. a) Explain the working of a four stroke petrol engine with a sketch and P-V diagram. [5]
- b) Describe with the help of a neat sketch the working of Oceanic boiler. [5]
- 13. a) Illustrate the working of a compound gear train with the help of neat sketch. [5]
- b) A belt is running over a pulley of diameter 120 cm at 200 rpm. The ratio of contact is 10% and coefficient of friction between the belt and pulley is 0.3. If the maximum tension in the belt is 3000 N, estimate the power transmitted by the belt. [5]
- 14. a) Explain the working of V centrifugal with a sketch and mention its applications. [5]
- b) A turbine is to operate under a head of 25 m at 200 rpm. The discharge is 9 cumec meters per second. If the overall efficiency of the turbine is 90%. Determine the power developed by the turbine. [5]
- 15. a) Describe the working of centrifugal pump with a sketch. [5]
- b) A single acting reciprocating pump, turning at 30 rpm delivers 0.01 m<sup>3</sup> of water. The diameter of the piston is 200 mm and stroke length is 400 mm. Determine (i) The theoretical discharge of the pump, (ii) Co-efficient of discharge and (iii) slip and percentage slip of the pump. [5]