

FACULTY OF ENGINEERING
B.E. 2/4 (EEE) I – Semester (Suppl.) Examination, July 2014

Subject: Principles of Mechanical Engineering

Time: 3 Hours

Max.Marks: 75

Note: Answer all questions from Part A. Answer any five questions from Part B.

PART – A (25 Marks)

- 1 Apply steady flow energy equation for a boiler and derive the equation.
- 2 An electrical copper conductor of diameter of 2 mm is to be covered with plastic insulation. The thermal conductivity of plastic is $K_{\text{Plastic}} = 0.5 \text{ W/mK}$, for copper $K_{\text{copper}} = 400 \text{ W/mK}$ and $h = 8 \text{ W/m}^2\text{K}$. Find out the critical radius of insulation.
- 3 Explain the following terms as applied to IC engines: (a) Compression ratio (b) Brake power (c) Indicated power (d) Brake thermal efficiency.
- 4 Write the essentials of a good steam boiler.
- 5 What is an Epicyclic gear train and write the special advantages of epicyclic gear trains.
- 6 How does the velocity ratio of a belt drive effect, when some slip is taking place between the belt and the two pulleys?
- 7 Find the head loss due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3.0 m/s using Darcy's formula.
Take $f = 0.00256$.
- 8 Define specific speed, unit speed, unit power and unit discharge.
- 9 Describe the working principle of a reciprocating pump.
- 10 What is an air vessel? Describe the function of the air vessel for reciprocating pumps.

PART – B (50 Marks)

- 11 a) A stainless steel plate 2 cm thick is maintained at a temperature of 550°C at one face and 50°C on the other. The thermal conductivity of the stainless steel at the average temperature is 19.1 W/mK . Compute the heat transferred through the material per unit area.
b) Describe a simple vapour compression cycle giving clearly its flow diagram.
- 12 a) A single-cylinder, four-stroke oil engine is fitted with a rope brake dynamometer. The diameter of the brake wheel is 600 mm. The load applied on the brake is 200 N and the spring balance reads 30 N. If the engine runs at 450 rpm , what will be the brake power of the engine.
b) Describe the working of a simple vertical boiler.

- 13 a) What is a compound gear train and write the expression for speed ratio in terms of teeth on the drivers and followers.
b) Derive an expression for length of an open belt drive.
- 14 a) Derive Bernoulli's equation.
b) Describe the working of Pelton wheel.
- 15 a) A single acting reciprocating pump, running at 50 rpm delivers 0.01 m³/s of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine the theoretical discharge and coefficient of discharge.
b) Draw the velocity triangles at inlet and outlet for a centrifugal pump.
- 16 a) Write the differences between 2 stroke and 4 stroke engines.
b) Write the classification and applications of heat exchangers.
- 17 Write short notes on the following:
a) Working of air compression system and applications
b) Eco friendly refrigerants
c) Differences between centrifugal pump and reciprocating pump.
