**TUTORIAL SHEET**

**Year: B. Tech. I Year I Semester**

**Subject: Basic Mechanical Engineering**

**Session: 2020-21**

**CO1. Students will be able to understand the various machines and power transmission related to it.**

**TUTORIAL SHEET NO.1**

Q.1 Find the power transmitted by a belt running over a pulley of 500 mm diameter at 300 rpm. The coefficient of friction between belt and pulley is 0.24, angle of lap 150° and maximum tension in belt is 2.4525 KN.

Q.2. A pulley 30 cm in diameter running at 200rpm is connected by a belt to another pulley at a distance of 3m, the second pulley has to run at 120 rpm. The belt is 5 mm thick. Allowing a slip of 3% between the belt and each pulley, determine the size of second pulley and % of total effective slip.

**TUTORIAL SHEET NO. 2**

Q.3 A belt drive is required to transmit 10KW from a motor running at 400 rpm. He belt is 12 mm thick and has a mass density of 0.01 gm/mm3. Safe stress in the belt is not to exceed 2.5 N/mm2. Diameter of driving pulley is 240 mm whereas the speed of driven pulley is 200 rpm. The two shafts are 2 m apart. Determine the width of the belt. Take μ=0.3.

Q.4 3KW of power is transmitted by an open belt drive. The linear velocity of belt is 3m/s. The angle of lap of the smaller pulley is 150°. The coefficient of friction is 0.3. Determine the effect on power transmission in following cases:

(i)Initial tension in the belt is increased by 8%

(ii)Initial tension in the belt is decreased by 8%

(iii)Angle of lap is increased by 8% by use of idler pulley, for same speed and tension on tight side.

(iv) Coefficient of friction is increased by 8% by suitable dressing to friction surface of the belt.

**TUTORIAL SHEET NO.3**

Q.5 An open belt drive connects two pulley 120 cm and 50 cm diameter, on parallel shaft 4 m apart. Maximum tension in the belt is 1855.3 N. The driver pulley of 120 cm diameter runs at 200 rpm. Determine the power transmitted. Take μ=0.3

Q.6 Derive the expression for ratio of tensions on slack and tight side of flat belt.

**TUTORIAL SHEET NO.4**

Q.7 An engine working on Otto cycle has a clearance of 17% of stroke volume and initial pressure of 0.95 bar and temperature 30⁰C. If the pressure at the end of constant volume heating is 28 bar, find:

(i) Air standard efficiency (ii) The max. Temp. in the cycle (iii) Ideal mean effective pressure.

Q.8 In an air standard Otto cycle, the compression ratio is 7 and the compression begins at 1 bar and 313K. the heat added is 2510 kJ/kg. Find the

(1). Maximum temp and pressure of the cycle (2) Cycle efficiency and mean effective pressure.

Take for air Cv=0.718kJ/kgK and R=287 J/kgK

**TUTORIAL SHEET NO.5**

Q.9 A four stroke petrol engine of 250 mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.01052 m3.The initial pressure and temperature are 1 bar and 47°C.If the maximum pressure is limited to 25 bar, then find the efficiency of the cycle..

Q.10 The bore and stroke of an engine working on the Otto cycle are 17cm and 30 cm respectively. The clearance volume is 0.001025 m3 .Calculate the air standard efficiency.

**TUTORIAL SHEET NO.6**

Q.11 Derive the expression for Length of open belt.

Q.12 Derive the expression for Length of cross belt.

**CO2: Students will be able to describe the importance of mechanical engineering in any industry and to relate with various concepts in thermal based industry.**

**TUTORIAL SHEET NO.1**

Q.1 Explain impulse turbine with diagram.

Q.2 Explain reaction turbine with diagram

**TUTORIAL SHEET NO.2**

Q.3 Briefly describe steam power plant with neat diagram.

Q.4 Briefly describe diesel power plant with neat diagram.

**TUTORIAL SHEET NO.3**

Q.5 Briefly describe nuclear power plant with neat diagram

Q.6 Briefly describe gas turbine power plant with neat diagram.

**TUTORIAL SHEET NO.4**

Q.7 Briefly describe hydro electric power plant with neat diagram

Q.8 Describe working of Cochran boiler with neat and clean diagram.

**TUTORIAL SHEET NO.5**

Q.9 Describe working of Lancashire boiler with neat and clean diagram.

Q.10 Describe working of Babcock & Wilcox boiler with neat and clean diagram

**TUTORIAL SHEET NO.6**

Q.11 Describe the working of Benson boiler with neat and clean diagram.

Q.12 Describe working of Lamont boiler with neat and clean diagram

**CO3: Students will be able to understand the refrigeration system and manufacturing process.**

**TUTORIAL SHEET NO.1**

Q.1: Explain reversed Carnot cycle with neat diagram.

Q.2 Explain reversed Brayton cycle with neat diagram.

**TUTORIAL SHEET NO.2**

Q.3 Explain vapor compression refrigeration cycle with neat diagram.

Q.4 Explain vapor absorption refrigeration cycle with neat diagram

. **TUTORIAL SHEET NO.3**

Q.5 Expalin the working of an ice plant with the help of a neat sketch.

Q.6 Explain the working of a split air conditioner?

**TUTORIAL SHEET NO.4**

Q.7 Enlist various properties of moulding sand.

Q.8 What is casting defect? Explain any five types of casting defects with their remedies.

**TUTORIAL SHEET NO.5**

Q.9 Write the classification of furnaces? Explain the working of cupola furnace and give its advantages and disadvantages.

Q.10 Give the detail classification of various welding processes

**TUTORIAL SHEET NO.6**

Q. 11 Distinguish between wire drawing and tube drawing with sketches.

Q.12 Explain the various operation performed by lathe machine.

**CO4: Students will be able to relate the industrial issues with the environment and to consider key concepts in engineering materials.**

**TUTORIAL SHEET NO. 1**

Q.1 Explain Annealing, its principle and applications with example.

Q.2 Explain the different methods of heat treatment

**TUTORIAL SHEET NO.-2**

Q.3 Discuss the characteristics of aluminium and also mention its alloys, their properties and uses.

Q.4 Discuss the influence of each of the following alloying elements on the properties of steel:

(i) Molybdenum (ii) Chromium (iii) Manganese (iv) Vanadium (v) Titanium (vi) Tungsten.

**TUTORIAL SHEET NO. 3**

Q.5 What are stainless steels? What are the main characteristics of stainless steels?

Q.6. Name different types of stainless steels and their main applications.

**TUTORIAL SHEET NO.4**

Q.7 Write a short note on

* + 1. Carburising (ii) Nitriding (iii) Flame hardening (iv) Cyaniding

Q.8 What is Hardening? Discuss in detail on different hardening methods and mechanism. Compare hardening and annealing.

**TUTORIAL SHEET NO. 5**

Q.9 Explain properties and application of cast iron

Q.10 What are compositions of: (i) brass (ii) Gun metal (iii) Bell metal (iv) bronze

**TUTORIAL SHEET NO. 6**

Q.11 Write short notes on:

* + 1. Hardening (ii) Quenching (iii)Tempering

Q.12 What is meant by Normalizing? How is it done? What are its effects on the properties of Steel?