

**B.E/B.TECH DEGREE EXAMINATIONS: NOV/DEC 2024**

(Regulation 2018)

Fifth Semester

**TEXTILE TECHNOLOGY**

U18TXT5001: Mechanics of Textile Machinery

(A3 size drawing sheet need to be issued with answer booklet)

**COURSE OUTCOMES**

- CO1:** Define the importance of gear and belt drives and to express the relationship between tensions in belt drives and also the condition for maximum power transmission
- CO2:** Design the profiles of cone drums used in speed frames as well as scutcher, plain and twill tappets and ring frame builder motion cams.
- CO3:** Calculate the picking force, shuttle velocity and acceleration in weaving machines and to use the equations of motions in textile applications.
- CO4:** Justify the use of kinetic energy, potential energy and principle of moments in textile industry.
- CO5:** Explain the importance of friction in textile applications and to point out the applications of brakes and clutches in textile industry and to derive the expressions for the torque transmitting capacity of various types of clutches.

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 2 = 20 Marks)**

**(Answer not more than 40 words)**

- |   |     |                   |
|---|-----|-------------------|
| 1. Justify the use of helical gear over spur gear.  | CO1 | [K <sub>2</sub> ] |
| 2. State the applications of planetary gears.   | CO1 | [K <sub>2</sub> ] |
| 3. Which are the factors to be considered in the design of cone drum for speed frame?   | CO2 | [K <sub>2</sub> ] |
| 4. What is the speed ratio of crank and tappet shaft for a 2/2 twill weave?   | CO2 | [K <sub>2</sub> ] |
| 5. A circular knitting machine of diameter 20 inch performs a revolution in 1.2 s. What is the acceleration if uniform angular velocity may be assumed?         | CO3 | [K <sub>2</sub> ] |
| 6. The traveller of a ring spinning machine is rotating at 15000 rev/min. Calculate the angular speed of the traveller in rad/s if $\pi$ is assumed to be 3.14. | CO3 | [K <sub>2</sub> ] |
| 7. Define Radius of Gyration and its relationship with moment of inertia and kinetic energy.  | CO4 | [K <sub>2</sub> ] |
| 8. What do you understand by the term “Principle of Moments”?   | CO4 | [K <sub>2</sub> ] |
| 9. State the laws of friction.  | CO5 | [K <sub>2</sub> ] |
| 10. Define sley eccentricity.   | CO5 | [K <sub>2</sub> ] |

**Answer any FIVE Questions:-**  
**PART B (5 x 16 = 80 Marks)**  
**(Answer not more than 400 words)**

- |     |    |   |    |     |                   |
|-----|----|---|----|-----|-------------------|
| 11. | a) | Sketch the herringbone gear and summarise its features  | 4  | CO1 | [K <sub>2</sub> ] |
|     | b) | Explain the different types of belts used in power transmission. Discuss their applications and advantages.   | 12 | CO1 | [K <sub>4</sub> ] |
| 12. | a) | Discuss the construction of PIV gears with diagram and their application in textile manufacturing.  | 6  | CO1 | [K <sub>4</sub> ] |
|     | b) | Explain the working of any one differential drive of speedframe and derive the speeds for various elements.   | 10 | CO2 | [K <sub>4</sub> ] |
| 13. | a) | Discuss the principle and construction of piano feed regulation with illustrations.   | 6  | CO2 | [K <sub>2</sub> ] |
|     | b) | Design a shedding tappet for 2/1 twill with the following conditions:<br>Treadle lever is directly connected to the heald shaft; Down position of bowl corresponds to down position of the bowl; Lifting by means of spring;<br>Nearest distance between bowl and tappet centres: 7 cm; Lift of tappet: 5 cm;<br>Diameter of the bowl: 6 cm; Dwell: 1/3 pick  | 10 | CO2 | [K <sub>5</sub> ] |
| 14. | a) | Write the equations for linear and angular motion.  | 4  | CO3 | [K <sub>4</sub> ] |
|     | b) | A loom shuttle leaves the warp shed with a speed of 10 m/s and has to be brought to rest in further 25 cm of movement. It should be stopped before the crankshaft moves a further 1.0 rad and the loom is operating at 180 picks/min. (A) Calculate the retardation on the assumption that it is uniform; (B) state whether the shuttle will be stopped in time; and (C) assuming that the shuttle stops just as the crank completes the 1.0 rad movement, calculate the average retardation. | 12 | CO3 | [K <sub>5</sub> ] |
| 15. | a) | A ringframe traveller moving round a ring of diameter 4 cm at a speed of 8000 rev/min. presses against the ring with a normal force of 1.25 N. What power is needed to overcome this type of frictional resistance if $\mu = 0.1$ and there are 400 spindles in the frame. Ringrail thickness and centripetal force may be neglected.   | 8  | CO4 | [K <sub>5</sub> ] |
|     | b) | The two weighting chains of a loom friction let of motion each make 1.5 laps round the ruffle and $\mu$ is 0.15. Find the resistance to movement if the tension on the tighter side of each chain is 1350 N.  | 8  | CO5 | [K <sub>5</sub> ] |
| 16. | a) | List out the various types of brakes and explain the construction of any two types of clutches with diagram.  | 6  | CO5 | [K <sub>4</sub> ] |
|     | b) | Discuss in detail various types of clutches used in textile machines with suitable sketches.  | 10 | CO5 | [K <sub>4</sub> ] |

\*\*\*\*\*