

## School of Engineering

**B.TECH Mechanical Engineering  
Semester End Examination - Jun 2024**

**Duration : 180 Minutes  
Max Marks : 100**

### Sem VI - G3UB606T - Design of transmission systems

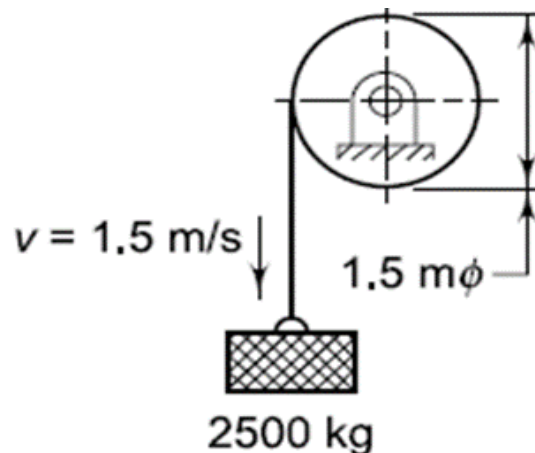
General Instructions

*Answer to the specific question asked*

*Draw neat, labelled diagrams wherever necessary*

*Approved data hand books are allowed subject to verification by the Invigilator*

- 1) Why is the tangential component of gear tooth force called 'useful' component? K1(2)
- 2) Give four examples of bevel gear application. K2(4)
- 3) Compare single and multi plate clutch. K2(6)
- 4) Draw the structure diagrams and gear box layout for the equation  $2(1) 2(2)$ . K3(9)
- 5) A pair of worm gears is designated as, 2/54/10/5. Calculate (i) the centre distance; (ii) the speed reduction; (iii) the dimensions of the worm and worm wheel. K3(9)
- 6) One Kilowatt power at 720 rpm is supplied to the worm shaft. The number of starts for threads of the worm is four with a 50 mm pitch–circle diameter. The worm wheel has 30 teeth with 5 mm module. The normal pressure angle is  $20^\circ$ . Calculate the efficiency of the worm gear drive and the power lost in friction. K5(10)
- 7) A mass of 2500 kg is lowered at a velocity of 1.5 m/s from the drum as shown in Figure. The mass of the drum is 50 kg and its radius of gyration can be taken as 0.7 m. On applying the brake, the mass is brought to rest in a distance of 0.5 m. Determine (i) the energy absorbed by the brake; and (ii) the torque capacity of the brake. K4(12)



- 8) A single plate clutch is designed to transmit 10 kW power at 2000 rpm. The equivalent mass and radius of gyration of the input shaft are 20 kg and 75 mm respectively. The equivalent mass and radius of gyration of the output shaft are 35 kg and 125 mm respectively. Calculate: (i) the time required to bring the output shaft to the rated speed from rest; and (ii) the heat generated during the clutching operation. K5(15)
- 9) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is  $20^\circ$ , while the helix angle is  $25^\circ$ . The face width is 40 mm and the normal module is 4 mm. The pinion as well as the gear is made of steel 40C8 ( $S_{ut} = 600 \text{ N/mm}^2$ ) and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and Determine the power transmitting capacity of gears. K5(15)
- 10) Design a worm and worm gear to transmit 2 kW from an electric motor revolving at 1440 rpm to a machine running at 72 rpm. Load is intermittent and steady. Gear is made of phosphor bronze and the worm of hardened steel. The gears are manufactured by hobbing process. K6(18)