

Paper ID [ME302]

(Please fill this Paper ID in OMR Sheet)

B.Tech. (Sem. - 6th/7th)

MACHINE DESIGN - II (ME - 302)

Time : 04 Hours

Maximum Marks : 60

Instruction to Candidates:

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Two** questions from Section - C.

Section - A

Q1)

(10 × 2 = 20)

- a) Are the angles of groove in a V-belt pulley equal to angle of V-belt? If not, why?
- b) Which theory should we use for designing clutch and why?
- c) What should be the desirable properties of spring materials?
- d) On what basis the material of flywheel is selected?
- e) Explain the failure modes of gears.
- f) What is the advantage of graduating the leaves of a laminated leaf spring?
- g) What are virtual teeth?
- h) What is rated life for a roller bearing? How is it different from median life?
- i) What is de-energizing brake?
- j) List at least four materials for flat belt.

Section - B

(4 × 5 = 20)

- Q2) List the advantages and disadvantages of Flat belt, V -belt, rope and chain.
- Q3) Describe the detail design process for computer aided design. Discuss, how use of computers assist a designer in each stage of the design process with respect to reducing the time and providing wider spectrum to design solutions.

- Q4)** A simple band brake operates on a drum of 600 mm in diameter that is running at 200 rpm. The coefficient of friction is 0.25. The brake band has a contact angle of 270° , one end is fastened to a fixed pin (that also happens to be one end of the lever arm) and the other end is to the brake arm 125 mm from the fixed pin. The straight brake arm is 750 mm long and placed perpendicular to the diameter that bisects the angle of contact. The brake drum is attached to a 450 mm diameter hoisting drum that sustains a load of 7500 N suspended on a rope. Determine (a) the necessary pull on the end of brake arm to sustain the weight and the direction of rotation, (b) width of the steel band (2 mm thick) if the allowable stress is 50 MPa.
- Q5)** What AFBMA stands for? How ball and roller bearings are designated? Specify the conditions which suitably select one bearing amongst the ball, roller, needle and taper roller bearings.
- Q6)** Derive the expression for the stress in the rim of a flywheel.

Section - C

(2 × 10 = 20)

- Q7)** (a) A helical gear has 30 teeth and a pitch diameter 264 mm. Normal module $m_n = 6.5$ mm, normal pressure angle is 20 degree. The tangential force is 5125 N. Find the power transmitted at 600 rpm and the formative number of teeth. Design and draw suitable flywheel for a four stroke, four cylinder, 133 kW engine running at 375 rpm.
- (b) Select a suitable chain drive to transmit 30 kW from an electric motor running at 1200 rpm to a line shaft running at 250 rpm. Motor shaft diameter is 60 mm and the centre distance is approximately 600 mm. Service is 10 hr/day, 6 days a week. Good lubrication condition is expected.
- Q8)** (a) Discuss the design procedure of lubrication system in transmission system.
- (b) Design a dry single plate friction clutch for following data $P = 25$ kW, $N = 1440$ rpm, mean radius = 5 x face width.
- Q9)** (a) A spring is to be designed which is subjected to a load varying from 0.4 kN to 1 kN. Use proper allow steel wire.
- (b) What should be the desirable properties of a gear material? Explain the complete design procedure of a spur gear.