

Day: Thursday  
Date: 22/11/2018

W-2018-2817

Time: 02.30 PM TO 05.30 PM  
Max Marks: 80

**N.B:**

- 1) **Q. No. 1 and Q. No. 5 are COMPULSORY.** Out of remaining **ANY TWO** question from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answer to the both section should be written in **SEPARATE** answer book.
- 4) Assume suitable data, if necessary.

**SECTION-I**

- Q.1** a) Explain the laws of the friction (05)  
b) Explain with neat sketch Rope Brake Dynamometer. (05)  
c) Explain helical gear force analysis with neat sketch. (04)
- Q.2** A rope drive transmits 74 kW through a 1.50 m diameter  $45^\circ$  grooved pulley rotating at 200 rpm. Angle of lap is  $160^\circ$ . The mass of each rope is 0.06 kg/m and can safely take a pull of 800 N. Taking centrifugal tension into account, determine i) Initial rope tension ii) The number of ropes required. Take  $\mu = 0.30$ . (13)
- Q.3** a) Explain with neat sketch Braking effect in a vehicle. (07)  
b) Describe with neat sketch the working of single plate friction clutch. (06)
- Q.4** a) Two spiral gears of same hand having normal pitch of 14 mm drives a machine tool. The gears are of same size and their centre distance is approximately 150 mm. The angle between shaft is  $70^\circ$  and speed ratio 2. Take friction angle  $8^\circ$ . Determine i) Spiral angle of each wheel ii) Number of teeth on each wheel iii) Efficiency of the drive and iv) Maximum efficiency. (13)

**SECTION-II**

- Q.5** a) Explain with neat sketch terminology of worm. (05)  
b) Explain with neat sketch different types of cam. (05)  
c) Explain the function of a flywheel. (04)
- Q.6** a) Derive the expression for maximum efficiency of spiral gearing. (07)  
b) Explain with neat sketch compound and reverted gear train. (06)
- Q.7** a) A cam rotating at 150 rpm operates a reciprocating roller follower of radius 2.5 cm. The follower axis is off-set by 2.5 cm to the right. The least radius of the cam is 5 cm and the stroke of the follower is 5 cm. Ascent and descent both takes place by uniform acceleration and retardation. Ascent takes place during  $75^\circ$  and descent during  $90^\circ$  of cam rotation. Dwell between ascent and descent is  $60^\circ$ . Draw the cam profile. (13)
- Q.8** a) A punching press is required to punch 40 mm diameter holes in a plate of 15 mm thickness at a rate of 30 holes per minute. It requires 6 N-m of energy per  $\text{mm}^2$  of sheared area. If the punching takes 1/10 of a second and the rpm of the flywheel varies from 160 to 140, determine the mass of the flywheel having radius of gyration of one metre. (13)