

Total No. of Questions : 8]

SEAT No. :

P1000

[Total No. of Pages : 3

[5870]-1028

T.E. (Mechanical)

**DESIGN OF TRANSMISSION SYSTEM
(2019 Pattern) (Semester - II) (302051)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Four questions from the following.*
- 2) *Draw neat labeled diagrams wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of non programmable electronic calculator is permitted.*
- 5) *Assume Suitable/Standard data if necessary.*

- Q1)** a) Explain design and performance variables of hydrodynamic journal bearing. [5]
- b) Derive the Petroff's equation for hydrodynamic bearing. Also state its limitation? [6]
- c) A single row deep groove ball bearing subjected to 30 second work cycle that consist Part-I: Radial load 45 kN; Axial Load 12.5 kN; duration 10 second; speed 720 rpm. Take $X=1$ and $Y=0$ Part II: Radial load 15kN; Axial Load 6.25 kN; duration 20 second; speed 1440 rpm, take $X=0.56$ and $Y=1.42$. Take $C_0 = 50$ kN; $C = 68$. Find Expected life of the bearing in hours. [6]

OR

- Q2)** a) A single row deep groove ball bearing is subjected to $F_r = 8$ kN, $F_a = 3$ kN, $X = 0.56$, $Y = 1.4$ and $N = 1200$ rpm. Diameter of shaft is 75 mm, Bearing number 6315 with $C=12000$ N Find : [5]
- i) L_{10} for 90% reliability;
 - ii) reliability for $l=20000$ hrs.
- b) Derive the Stribecks equation for basic static capacity of bearings. State the assumption made. [6]
- c) Explain the procedure for selection of the ball bearing from manufacturing catalogue. [6]

P.T.O.

- Q3) a)** Explain self-energizing block brake and self-locking block brake. [4]
- b)** Draw a diagram for pivoted Block brake with long shoe? Write the equation for reaction on pivot points and Braking torque. [6]
- c)** Draw neat sketch diagram of Cone clutch and explain construction and working. Why is the semi-cone angle of a cone clutch made 12.5° ? [7]

OR

- Q4) a)** What are the two theories applied to friction plates? Why clutches are usually designed on the basis of uniform wear? [4]
- b)** Draw neat sketch diagram, explain construction and working of single plate clutch and multi plate clutch. [6]
- c)** What is the condition of self-locking in differential band brake? Why should it be avoided in speed-control brakes? What are the advantages and disadvantages of band brake? [7]

- Q5) a)** What is the need of multi-speed gear box in drive system of a machine tool? [4]
- b)** Explain the following parameters considered in kinematic design of multi-speed gear box; [4]
- i) Range Ratio
 - ii) Geometric Progression Ratio
 - iii) Number of spindle speed steps
 - iv) Number of stages of gear box
- c)** A 9 speed gear box is to be connected to a motor running at 720 rpm through a belt drive. The gear box is to have a minimum speed of 31.5 rpm and a maximum speed of 500 rpm. Using standard spindle speeds. [10]
- i) Draw the structure and speed diagram for the arrangement;
 - ii) Draw the gear box;
 - iii) Select suitable standard pulley diameter for connecting the motor to the gear box shaft. The standard pulley diameters are based on R20 series with a diameter starting from 80 mm.

OR

- Q6)** a) State the law of Harmonic progression used in machine tool gearbox design. State its advantages and disadvantages. [4]
- b) Justify the statement: All the structural formulae of the form $z = P_1(x_1) P_2(x_2) \dots P_n(x_n)$ cannot be converted into structural diagrams, and hence are not feasible. [6]
- c) Draw structural diagrams for the following structural formulae and identify the optimum structural formula out of them. Draw the gearing diagram for the optimum structural formula. [8]
- i) $2(1)3(2)$; ii) $2(3)3(1)$;
 iii) $3(2)2(1)$; iv) $3(1)2(3)$

- Q7)** a) Classify the Hybrid Electric Vehicle? Explain any one in detail from Series or Parallel Configuration of Hybrid Electric Vehicles. [6]
- b) Explain The basic modes of operations used of Hybrid Electric Vehicles? Define Degree of Hybridization. [6]
- c) Explain any six components of Hybrid Electric Vehicles? [6]

OR

- Q8)** a) Explain how the performance analysis carried in Series and parallel Hybrid Electric Vehicles? [6]
- b) What are the advantages and disadvantages of Hybrid Electric Vehicles? [6]
- c) Explain Power Split Device with neat sketch? [6]
