

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  $C=1$  2000 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  $12.5^\circ$ ? [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]
- Range Ratio
  - Geometric Progression Ratio
  - Number of spindle speed steps
  - 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]
- Draw the structure and speed diagram for the arrangement;
  - Draw the gear box;
  - 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]

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