**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-1. Radial load 45 kN; Axial Load 12.5 kN; duration 10 second; speed 720 rpm. Take X=l 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=l 12000 N Find : **[5]**

i) $L_{10}$ for 90% reliability;

ii) reliability for 1=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 $z = P_1(x_1)\ P_2(x_2)$ ..... $P_n(x_N)$ 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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