

Total No. of Questions : 8]

SEAT No. :

PB-3903

[Total No. of Pages : 3

[6262]-168

T.E. (Mechanical)

DESIGN OF TRANSMISSION SYSTEMS

(2019 Pattern) (Semester - II) (302051)

Time : 3 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) Classify the bearings as per direction of force and type of friction? [4]
- b) State the assumptions and write the Reynold's equation for 2-D flow and explain the significance of each term in it? [6]
- c) A ball bearing is subjected to $F_r = 3 \text{ kN}$, $N = 720 \text{ rpm}$ having expected life 10000 hrs. at 95% reliability. Calculate the dynamic load carrying capacity of the bearing at 90% of reliability. Also find System reliability for such 4 bearings. [7]

OR

- Q2) a) A single row deep groove ball bearing subjected to following work cycle. If $L_{10h} = 8000 \text{ hrs.}$ Select bearing from the following table. What is average speed of bearing? [6]

F_r (kN)	F_a (kN)	X	Y	Race Rotating	C_s	Speed rpm	Fraction of cycle
1.5	0.25	1.0	0	Inner	1.2	400	1/10
1.0	0.75	0.56	2	outer	1.8	500	1/4
5.0	1.1	0.56	2	Inner	1.5	600	1/2
1.0	--	1.0	0	outer	2.0	800	Remaining

C (kN)	29.6	46.2	74.1	99.5
Bearing No	6011	6211	6311	6411

P.T.O.

- b) Derive the Petroff's equation for hydrodynamic bearing. Also state its limitation? [7]
- c) Two identical ball bearings A and B are used in two different applications. The load on the bearing B is half of that bearing A. The remaining conditions are identical. What will be the expected life of bearing B as compared to bearing A. [4]

- Q3)**
- a) What are the characteristics for material used for brake lining? Name the materials used? [4]
 - b) Explain Disc brakes and mention advantages and disadvantages of disc brake [6]
 - c) Draw a figure for is Internal expanding shoe brake and write the assumptions on which its analysis depends? State the observations made when the vehicle will be travelling in 'reverse' for anti-clockwise rotation of brake drum? [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) What are the desirable properties for good friction material? Name the friction materials used in clutches. [6]
 - c) Draw neat sketch diagram of Cone clutch and explain construction and working. State the advantages, disadvantages and practical applications of Cone clutch? [7]

- Q5)**
- a) What is structural formula? Write any three structural formulae for twelve speed gear box. [6]
 - b) Differentiate between arithmetic, geometric and Harmonic progressions in case of design of gear box. [6]
 - c) Draw the structure diagrams and gear box arrangements for the following equations, [6]
 - i) 2 (1) 3 (2); ii) 2 (3) 3 (1); iii) 3 (1) 2 (3); d) 3(2) 2 (1)

OR

- Q6)** a) Explain the significance of geometric progression ratio. [6]
- b) Explain the term: Transmission range with reference to machine tool gear box. [6]
- c) Draw speed diagram and layout for a six speed gear box having the following structural formula: i) 2 (3) 3 (1); ii) 2 (1) 3 (2). The output speeds are 160 rpm minimum and 1000 rpm maximum. The motor shaft speed is 1440 rpm. [6]

- Q7)** a) Define Degree of Hybridization. Explain in details Micro Hybrid and Mild Hybrid. [6]
- b) Explain how the performance analysis carried in Series and parallel of Hybrid Electric Vehicles? [6]
- c) Explain the Sizing performance for Hybrid Electric Vehicle Components? Explain the optimal sizing in HEV components? [6]

OR

- Q8)** a) Explain Hybrid Electric Vehicle with the help of block diagram? What are the advantages and disadvantages of Hybrid Electric Vehicles? [6]
- b) Explain The basic modes of operations used Hybrid Electric Vehicle?[6]
- c) Explain how the performance analysis carried in Series and parallel of Hybrid Electric Vehicles? [6]

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