

Total No. of Questions : 8]

SEAT No. :

P347

[Total No. of Pages : 4

[6003] - 428

T.E. (Mechanical)

DESIGN OF TRANSMISSION SYSTEMS

(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 indicate full marks.
- 4) Use of non programmable electronic calculator is permitted.
- 5) Assume suitable/standard data if necessary.

Q1) a) Compare Hydrodynamic bearing with hydrostatic bearing? [5]

b) Derive the stribecks equation for basic static capacity of bearings. State the assumption made. [6]

c) A single row deep groove ball bearing subjected to following work cycle. If  $L_{10h} = 12000$  hrs. at 95% reliability Find dynamic load carrying capacity at 90% reliability; and system reliability if such six bearings are there? [6]

| $F_r$<br>(kN) | $F_a$<br>(kN) | X    | Y   | Race<br>Rotating | $C_s$ | Speed<br>rpm | %<br>Time |
|---------------|---------------|------|-----|------------------|-------|--------------|-----------|
| 10            | 3.0           | 0.56 | 2   | Inner            | 1.00  | 400          | 40        |
| 5.5           | 1.0           | 1    | 0   | Outer            | 1.25  | 800          | 30        |
| ---           | ---           | ---  | --- | Inner            | ---   | 600          | 30        |

OR

Q2) a) Explain with neat sketch hydrodynamic bearing. State the advantages, limitations and applications of the same. [5]

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- b) Derive the Petroff's equation for hydrodynamic bearing. Also state its limitation? [6]
- c) State the assumptions and write the Reynold's equation for 2-D flow and explain the significance of each term in it? [6]
- Q3)** a) Explain Differential band brake with neat sketch. Find the effort applied at the end of lever for Differential band brake. [4]
- b) What is the condition of self-locking in differential band brake? Why should it be avoided in speed-control brakes? Explain self-energizing block brake and self-locking block brake. [6]
- c) Draw a figure for 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) Why is the semi-cone angle of a cone clutch made  $12.5^\circ$ ? [4]
- b) What are the characteristics for material used for brake lining? Name the materials used? [6]
- c) Draw neat sketch diagram of centrifugal clutch and explain construction and working. What are the advantages, disadvantages and applications of centrifugal clutch? [7]
- Q5)** a) What is structural formula? Write any three structural formulae for twelve speed gear box. [4]
- b) Differentiate between arithmetic, geometric and Harmonic progressions in case of design of gear box. [6]

- c)) Draw structural diagrams for the following structural formulae and identify the optimum structural formula out of them. [8]

- i) 2(1) 3(2)
- ii) 2(3)3(1)
- iii) 3(2) 2(1)
- iv) 3(1) 2(3)

OR

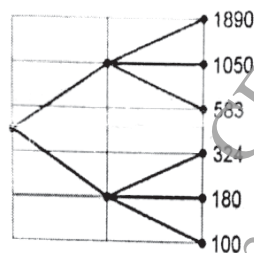
- Q6) a) Explain the terms. [5]

- i) Range ratio with reference to machine tool gear box design.
- ii) Transmission range with reference to machine tool gear box.

- b) Explain significance of geometric progression ratio. [5]

- c) Read the structure diagram given below and answer the following questions: [8]

- i) What is geometric progression ratio and range ratio of this gear box?
- ii) Write structure formula for this gear box;
- iii) What is the speed of input shaft of the gear box?
- iv) Draw schematic layout diagram of the gearbox and calculate number of teeth on each gear by assuming 20 teeth on smallest gear of each stage.



- Q7)** a) Explain any six components of Hybrid Electric Vehicles? [6]
- b) Explain Power Split Device with neat sketch? [6]
- c) Explain the basic modes of operations used of Hybrid Electric Vehicles? Define Degree of Hybridization. [6]

OR

- Q8)** a) Explain the sizing performance for HEV Components? Explain the optimal sizing in HEV components? [6]
- b) What are the advantages and disadvantages of Hybrid Electric Vehicles? [6]
- c) Explain the power Management for HEV system? Draw the flow chart for sizing methodology of powertrain? [6]

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