

Total No. of Questions : 8]

SEAT No. :

PA-1536

[Total No. of Pages : 3

[5926]-156

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 the following terms Hydrodynamic Bearing and Hydrostatic Bearing with neat sketch. [5]
- 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 single row deep groove ball bearing subjected to following work cycle. If $L_{10h} = 13000$ hrs. Find dynamic load carrying capacity; average speed of bearing and system reliability if such four bearings are there? [6]

F_r (kN)	F_a (kN)	X	Y	Race Rotating	C_s	Speed rpm	% Time
5	1.5	0.56	1.1	Inner	1.25	960	30
3.7	0.73	0.56	1.3	outer	1.40	1440	40
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OR

- Q2)** a) Explain the designation of rolling contact bearings with neat sketch. [5]
- b) 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 $C=112000$ N Find i) L_{10} for 90% reliability; ii) reliability for $l=20000$ hrs. [6]

P.T.O.

- c) Explain the following terms; [6]
- i) Dynamic load carrying capacity
 - ii) Equivalent bearing load
 - iii) Load life relationship

- Q3)** a) Explain self-energizing block brake and self-locking block brake. [4]
- b) With neat sketch explain Block brake with long shoe? Write the equation for Maximum pressure acts on brake, Frictional Force and Braking torque for the same. [6]
- c) Draw neat sketch diagram of Cone clutch and explain construction and working. State the advantages, disadvantages and applications of Centrifugal clutch? [7]

OR

- Q4)** a) What are the advantages, disadvantages and applications of Centrifugal clutch? [4]
- b) Draw neat sketch for single plate clutch and multi plate clutch. What is difference between single plate clutch and multi plate clutch? [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]

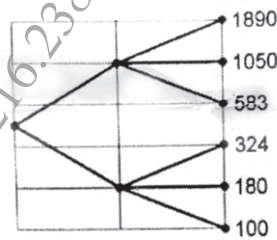
- Q5)** a) State the law of Arithmetic progression used in machine tool gearbox design. State its advantages and disadvantages. [4]
- b) Explain any four parameters considered in kinematic design of multi-speed gear box? [4]
- c) A four speed gear box is to be used for a machine tool drive. The spindle speeds range between 200 rpm to 820 rpm. Design the gear box. [10]

OR

- Q6)** a) Explain the term: Maximum loss of economic cutting speed. [4]
- b) Explain the terms [4]
- i) Range ratio with reference to machine tool gear box design.
 - ii) Transmission range with reference to machine tool gear box.

c) Read the structure diagram given below and answer the following questions: [10]

- i) What is geometric progression ratio and range ratio of this gear box?
- ii) Write structure formula for this gearbox;
- 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 Hybrid Electric Vehicle with the help of block diagram? What are the advantages and disadvantages of Hybrid Electric Vehicles? [6]
- b) Explain the important factors considered in the design of Hybrid Electric Vehicles components? [6]
- c) Explain any six components of Hybrid Electric Vehicles? [6]

OR

- Q8)** a) Explain Parallel Configuration of Hybrid Electric Vehicles with the help of Block diagram? [6]
- b) Explain Power Split Device with neat sketch? [6]
- c) Define Degree of Hybridization. Explain in details Full Hybrid and Plug-in Hybrid. [6]

