

Roll No. Total No. of Pages: 02

Total No. of Questions: 09

B.Tech.(AE) (2011 Onwards) (Sem.5) AUTOMOTIVE TRANSMISSIONS

Subject Code : BTAE-502 Paper ID : [A2062]

Time: 3 Hrs. Max. Marks: 60

INSTRUCTION TO CANDIDATES:

- SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
- 2. SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.
- 3. SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.

SECTION-A

Q1. Write briefly:

- a. What are the requirements of clutches?
- b. What is drag torque?
- c. Why the gear ratios are arranged in geometric progression?
- d. Mention the properties to be satisfied for the working fluid in hydrodynamic drive.
- e. How the reversing is achieved in a planetary gear set?
- f. Draw the curves of generator input torque and motor torque versus armature current.
- g. What is various hydraulic transmission devices use in practices?
- h. Why the wet-type multi plate disc clutch is preferred in automatic transmission system?
- i. What is the effect of slip in couplings?
- j. List out *any three* merits of automatic transmission system.

SECTION-B

- Q2. a. Draw the schematic diagram of hydraulic control system in automatic transmission.
 - b. A petrol engine develops 10 N-m torque at maximum bhp speed of 4000 *rpm*. Determine the diameter of the impellor required to transmit the torque for a slip of 3%.

1 M-70485 (S2)-112



- Q3. Explain the principle of operation of hydrodynamic fluid coupling with relevant sketch.
- Q4. What are the principles involved in hydrostatic drive? What are their advantages and limitations?
- Q5. Discuss about Toyota ECT-i transmission.
- Q6. What is fluid coupling? Draw and explain its performance curves.

SECTION-C

- Q7. Explain the principle of the Ward Leonard type of control for electric drive.
- Q8. A rotor is driven by a co-axial motor through a single plate clutch, both sides of the plate being effective. The external and internal diameters of the plate are respectively 220 mm and 160 mm and the total spring load pressing the plates together is 570 N. The motor armature and shaft has a mass of 800 kg with an effective radius of gyration of 200 mm. The rotor has a mass of 1300 kg with an effective radius of gyration of 180 mm. The coefficient of friction for the clutch is 0.35. The driving motor is brought up to a speed of 1250 *rpm*. When the current is switched off and the clutch suddenly engaged.-Determine
 - a. The final speed of motor and rotor.
 - b. The time to reach this speed,
 - c. The kinetic energy lost during the period of slipping.

How long would slipping continue if it is assumed that a constant resisting torque of 60 N-m were present? If instead of a resisting torque, it is assumed that a constant driving torque of 60 N-m is maintained on the armature shaft, what would then be slipping time?

- Q9. The coefficient of the rolling resistance for a truck weighing 62000 N is 0.018 and the coefficient of air resistance of 0.0276 in the formula $R = KW + K_aAV^2$, where A is the frontal area of 5.57 m² and V is speed in km/hr. the transmission efficiency in top gear of 6.2:1 is 90% and that in the second gear of 15:1 is 88%. If the truck has maximum speed of 90 km/hr in top gear then calculate:
 - a. The b.p of engine.
 - b. The engine speed if the driving wheels have effective diameter of 0.82 m.
 - c. The maximum grade that a truck can negotiate at the above engine speed in second gear.

2 | M-70485 (S2)-112