Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, APR 2018

SUBJECT: AUTOMOTIVE TRANSMISSION SYSTEM [AAE 2251]

REVISED CREDIT SYSTEM
(17/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	Derive from the force and moment analysis, expressions for the maximum tractive effort and maximum acceleration of a rear wheel driven automobile with usual notations.	**(04)**
1B.	What is double de clutching? When this practice must be followed?	**(02)**
1C.	Design a single plate clutch for the following specifications. Maximum torque to be transmitted= 44.75 N-m, Face width of friction lining is equal to 0.5 times the mean radius, overload service factor=2.2, friction coefficient=0.26, mean lining pressure= 2.5 bar.	**(04)**
2A.	With a neat sketch, illustrate the constructional details of a transaxle. Where does it find applications?	**(03)**
2B.	What are hydrostatic drives? With a neat sketch, explain the working principle of a rotor type positive displacement pump.	**(03)**
2C.	For a motor car, the road resistance is 25 N per 1000 N of weight of vehicle and air resistance offered is modeled as $0.0827V^2$, where V is speed of vehicle in KMPH, transmission efficiency=88 %. The weight of the vehicle is 19,920 N. Find (i) The engine power required for a top speed of 144 KMPH. (ii) Acceleration of the vehicle at 48 KMPH if tractive effort at 48 KMPH in top gear is 25 % greater than that at 144 KMPH.	**(04)**

(iii) Power required to drive up a gradient of 1 in 5 at 48 KMPH with an efficiency of 80 % in lower gear.

3A. An epicyclic gear train has a fixed outer internal gear with 240 teeth. The planet gears have 20 teeth. If the input is given to arm and output is taken from sun gear, calculate the number of teeth on sun gear and ratio of the gear box. **(03)**

3B. Illustrate different working modes of a fluid coupling with corresponding velocity diagrams. **(03)**

3C. Sketch a gear shift valve and explain how the gear shifts are taking place in an automatic transmission. **(04)**

4A. A constant mesh gear box giving 3 forward and a reverse speed has the following overall gear ratios. G_3= 5:1, G_2= 8:1, G_1= 15:1, G_r=18:1, the permanent speed reduction is 5:1. The speed of the lay shaft is half that of the clutch shaft and the clutch pinion is to have at least 15 teeth. Show the arrangement and find the number of teeth of various gears. **(04)**

4B. Explain with a neat sketch, how the speed equalization takes place between the gear and the selector sleeve in a synchromesh gear box. **(03)**

4C. What are the functions of final drive in the transmission system? Define final drive ratio for a worm- wheel system. **(03)**

5A. Discuss how the transfer case acts as a range change unit in automobile transmission systems. **(04)**

5B. The engine of an automobile develops 28 kW at 1600 RPM. The bottom gear ratio available in the gear box is 3.06 :1, while the top gear is direct drive. If the propeller shaft with outer diameter of 4 cm is used, find the inside diameter of the shaft if the safe shear stress for the shaft material is 55000 kPa. **(03)**

5C. The engine of an automobile develops a maximum torque of 105 N-m at 2500 RPM and drives through a gearbox having constant mesh gears of 15 and 30 teeth respectively. The second gear wheel on main shaft has 36 teeth and the meshing pinion has 18 teeth. The final drive pinion has 6 teeth and gear has 30 teeth. If the effective wheel diameter is 840 mm and the drive line efficiency is 85%, determine the speed of the vehicle in second gear and torque transmitted to each half shaft. **(03)**