Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, APR/MAY 2017

SUBJECT: ADVANCED POWER TRAINS (ELECTIVE) [AAE 5231]

REVISED CREDIT SYSTEM
(27/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. Define tractive effort. Obtain expressions for the maximum tractive effort and maximum acceleration of a front wheel driven automobile with usual notations. **(03)**

1B. What are the factors that affect the whirling in Propeller shafts? **(02)**

1C. A single plate clutch is to be designed for transmitting a maximum torque of 370 N-m. A maximum wear of facings of 5 mm is to be allowed. Design with a safety factor of 25 % with a safe pressure intensity of 185 kN/m^2 normal to the surface, assuming the ratio of diameters as 0.6. find the dimensions of the clutch. **(04)**

If 9 springs are used and initial spring force is 20 % more than the spring force after allowable wear of 5 mm, find the spring stiffness. Assume the coefficient of friction as 0.35

1D. What are continuously variable transmission systems? **(01)**

2A. Deduce the expression for energy lost due to slip during engagement for friction clutches. **(03)**

2B. What are hydrostatic drives? With a neat sketch, explain the working principle of a swash plate type of variable displacement pump. **(03)**

2C. For a typical motor car of mass 1500 kg, coefficient of road resistance K_r= 0.01, air resistance R_a= 0.04AV^2, N, frontal area is 2.3 m^2 and speed is 50 kmph in top gear. The final drive ratio is 4.2:1 and transmission efficiency is 90% in all gears. Find the following. i) Power required on level road ii) If the tractive effort available is 1900 N, find the maximum gradient which the

vehicle can climb iii) Assuming power developed & speed of the engine is same as at 50 kmph in top gear, what will be the speed of the vehicle and gear reduction? **(04)**

3A. Torque developed by an automotive engine is 80 N-m at 2000 RPM. Final drive ratio of the vehicle is 4.7:1. In top gear, the inside road wheel makes 60 RPM. Calculate the torque and power at the inner and outer driving road wheels. **(02)**

3B. With the velocity diagrams, explain different modes of operation of a fluid flywheel. **(03)**

3C. Illustrate the working principle of a plate type of centrifugal clutch with a neat sketch and relevant working characteristic. **(03)**

3D. What are the most probable causes for (i) Clutch Juddering (ii) Humming noise? **(02)**

4A. Calculate the gear ratios of a 4-speed gear box and final drive ratio for a vehicle from the data:

Maximum engine torque: 105.2 N m at 2100 rev/min.

Maximum power: 37.3 kW at 4000 rev/mm, giving a road speed of 130 km/h as obtained from graphs and data. The rolling radius of road wheels is 0.36 m. Transmission efficiency is 90% and the maximum expected tractive resistance is 4890 N. **(04)**

4B. Define effective weight of the automobile? How is it evaluated? **(02)**

4C. With an illustrative sketch, explain the working principle of Hydraulic control system in Automatic transmission systems. **(04)**

5A. What is a transfer box? Discuss how it acts as a range change unit in automobile transmission systems. **(03)**

5B. An epicyclic gear box has a fixed outer gear C with 240 teeth. The planet gears have 20 teeth. The input is arm A and output is sun gear D. Calculate the number of teeth on the sun gear and the ratio of gear box. **(03)**

5C. Discuss the essential features of any two of the following. **(04)**

(i) Hotchkiss drive

(ii) Rzeppa joint

(iii) semi floating rear axle