Exam Date & Time: 28-Jun-2023 (02:30 PM - 05:30 PM)

# MANIPAL ACADEMY OF HIGHER EDUCATION

IV SEMESTER B.TECH END SEMESTER EXAMINATIONS, JUNE 2023

**AUTOMOTIVE TRANSMISSION SYSTEM [AAE 2271]**

**Marks: 50** **Duration: 180 mins.**

**A**

**Answer all the questions.**

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) Explain the factors influencing the power required to propel the vehicle in different road conditions. (4)

A)

B) Explain term tractive resistance. A car weighing 14950 N is travelling up a hill of slope 1 in 25 at a speed of 35.35 km/hr. The road resistance is 11.5 N per 1000 N and there is a head wind of 12.8 km/hr. If the projected area of the car is 1.67 $m^2$, calculate the total power employed in propelling the car. Assume $K_a$= 0.036788. (4)

C) Explain the parameters that limit the torque capacity of a friction clutch. (2)

2) A cone clutch with a cone Semi-angle of 12◦ is to transmit 11.19 kW at 750rpm.The width of the face is 1/4th of the mean diameter and the normal pressure between the contact faces is not to exceed $8.27\times10^4$Pa.Allowing the coefficient of friction of 0.2, (3)

A) determine the main dimensions of the clutch and the axial force required.

B) With the help of suitable diagram, describe the constructional features of a diaphragm spring type clutch. Discuss its advantages and disadvantages relative to the clutch employing helical springs. (4)

C) With neat sketch, explain the principle of torque transmission in electromagnetic clutch system. (3)

3) Explain the layout of power transmission in 4-wheel drive vehicle. With neat sketch, explain the function of transfer case in 4-wheel drive vehicle. (4)

A)

B) List and explain any four important reasons for the leakage of gearbox oil. (2)

C) Sketch a layout of three forward and one reverse speed constant mesh gearbox. Explain (4)

the torque transmission in each gear.

4) The engine of an automobile develops 28 kW at 1600 RPM. The bottom gear ratio available in the gearbox 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. (3)

A)

B) Classify the types of constant velocity joints. With neat sketch explain the features and torque transmission method of a Hooks Joint. (4)

C) Identify the types of rear axle casing of a commercial vehicle and explain the advantages and limitations of the same. (3)

5) With suitable sketch, explain the transfer of driving and torque reaction in a Hotchkiss rear axle drive unit. (4)

A)

B) Classify the types of power transmission system using Hydraulic fluid and explain the important features of the same. (3)

C) Explain how the Vacuum Modulator circuit is used to obtain different gear ratios in automatic transmission gearbox. (3)

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