Exam Date & Time: 31-May-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2023

AUTOMOTIVE TRANSMISSION SYSTEM [AAE 2271]

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

A

Answer all the questions.

Instructions to Candidates: Missing data may be suitably assumed

1) Classify the layouts of vehicle with respect to the locations of transmission system and explain the important features of each of them. (4)

A)

B) A motor vehicle weighs 7975.5 N and its engine develops 14.7 kW at 2500 rpm. At this engine speed, the road speed of the car on the top gear is 64.37 km/hr. Bottom gear reduction is 3.5:1 and the efficiency of transmission is 88% on top and 80% on bottom gear. The diameter of tyre is 0.762 m and the projected front area of the vehicle is 1.116 m^2. The coefficient of air resistance is 0.0314 N-h^2/km^2-m^2. $R=KAV^2$, where R is resistance in N, K is coefficient of resistance. A is the frontal area in m^2, Road resistance is 0.023W, N. Calculate Speed of car on bottom gear, Tractive effort available at the wheels on top and bottom gear, Gradient which car can climb on bottom gear. The tractive force at the wheels required to start the car on level road and attain a speed of 48.28 km/hr in 10 sec. Take average air resistance as half the maximum. (4)

C) Explain the features of the friction materials used in the clutch facing. (2)

2) Design a single plate clutch for an automobile to transmit a torque of 44.7336 N-m normally. The face width of the friction linings is 50 % of their mean radius. The friction coefficient to be adapted is 0.25. The average intensity of pressure normal to the surfaces is 2.5 bar. Consider an over load service factor of 2 during the design. (3)

A)

B) Classify the clutch actuation method used in vehicle and suitable sketch explain the working of Hydraulic clutch actuation system. (3)

C) Explain the characteristics of centrifugal clutch and prove that torque transmitted is a function of number of shoes, frictional force and radius of pulley. (4)

3) With a relevant diagram and performance curve, explain how torque modification occurs in a torque converter. (4)

	A)		
	B)	A constant mesh 2 stage gearbox giving 4 forward speeds has the drive pinion with 15 teeth and large meshing gear on lay shaft has 30 teeth. The 3rd, 2nd and 1st gears on lay shaft have 28, 22 and 18 teeth respectively. Find the gear ratios of the gearbox .Draw a layout and obtain the speeds of the vehicle in different gears for an effective wheel size of 500mm when the engine runs constantly at 2000 rpm. The final drive ratio is 5:1.	(4)
	C)	Explain the under gear and over gear condition of a vehicle using road performance curve.	(2)
4)		Explain the importance of critical speed of a propeller shaft and explain any two methods adopted to reduce the critical speed of a vehicle propeller shaft.	(3)
	A)		
	B)	With neat sketch explain the features and load distribution of fully floating axle hub of a commercial vehicle.	(3)
	C)	Identify the methods of actuation of shift valves and explain the construction and working of a centrifugal governor actuated shift valve of an automatic transmission system.	(4)
5)		With simple layout, explain the upshift and downshift process of a CVT system using servomechanism control system.	(4)
	A)		
	B)	Classify the types of motors used in Hydrostatic Transmission System and with neat sketch explain the working of axial piston type of motor.	(3)
	C)	Sketch a general arrangement of a live rear axle, identify, and explain the various loads that it has to withstand.	(3)

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