Exam Date & Time: 27-Jul-2022 (02:00 PM - 05:00 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

IV Semester End Semester Examination AUTOMOTIVE TRANSMISSION SYSTEM (AAE 2271)

AUTOMOTIVE TRANSMISSION SYSTEM [AAE 2271]

Marks: 50	Duration: 180) mins.
	Descriptive Questions	
Answer all	the questions. Section Duration: 18	0 mins
Missing data	a may be suitably assumed	
1)	Derive mathematical expressions for the effective mean radius and torque transmitted in case of a single plate clutch assuming different conditions.	(4)
A)		
B)	Describe a vacuum operated clutch in detail with the help of simple diagrams and compare it with hydraulic operated clutch.	(4)
C)	What are the essential properties required for a clutch facing material? Explain how these are met with common materials.	(2)
2) A)	An engine, which employs a cone clutch for torque transmission, develops 18.37 kW at 1000 rpm. The average diameter of the friction facing is 300 mm and cone angle is 25°. Average pressure intensity and coefficient of friction may be taken as 78.9 kPa and 0.25 respectively. Calculate the internal and external diameters and the width of the friction face. Assume uniform wear rate.	(3)
B)	A motor car weighs 11212.8 N and the engine develops 41 KW at 4500 RPM. The combined air and rolling resistance is given by the formula $R=40.82+0.0515V^2$. The performance characteristics are such that it will reach 120.5 km/hr at 4500 rpm and full throttle when engine is running in still air and at the same speed in second gear it will just climb a gradient of 1 in 10. The top and second gear ratios are 5:1 and 8:1 respectively.	(4)
	• Calculate the efficiency of transmission in 2 nd and top gear.	(-)
	• Calculate the engine power required for second gear with same efficiency of transmission as in the earlier case when climbing up the gradient of 1 in 20 at 48 km/h.	
C)	Explain the common troubles encountered in gearboxes and suggest remedies.	(3)

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3)	A)	A sliding mesh type of gear box with forward speeds only is to be designed. The gear box should have the following gear ratios available approximately: 1.0, 1.5, 2.5 and 3.9. The centre distance between the lay shaft and the main shaft is 78 mm and the smallest gear is to have at least 16 teeth with a diametral pitch of 3.25 mm. Calculate the number of teeth of the various gears and the exact gear ratios thus available and show the layout of the gearbox	(3)
	B)	What is an epicyclic gear box? Describe its principle with the help of a neat sketch.	(3)
	C)	What is an overdrive? Explain its construction and discuss its working with suitable sketches.	(4)
4)		Compare the features, working and torque transmission method of fluid coupling and torque convertor.	(3)
	A)		
	B)	The angle between the axes of two horizontal shafts connected by a Hookes joint is 20° . The driving shaft speed is uniform and is 200 r.p.m. A flywheel of weight 1 kN and radius of gyration 200 mm is attached to the driven shaft. If a steady torque of 1000 Nm resists rotation of the driven shaft determine the torque required at the driving shaft when it has turned through an angle of 45° from the initial position and the maximum angular acceleration of the driven shaft.	(3)
	C)	Explain the necessity of a differential in an automobile. Discuss in detail the construction and operation of the differential.	(4)
5)		Compare the features of full floating and semi floating rear axle drives.	(3)
	A)		
	B)	Explain the importance of throttle valve and hydraulic modulator in shifting gears in automatic transmission vehicle.	(3)
	C)	With neat sketch, explain the working and features of vane type hydraulic motors.	(4)

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