# Question Paper

Exam Date & Time: 05-May-2024 (02:30 PM - 05:30 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

FOURTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY 2024

**VEHICLE TRANSMISSION SYSTEMS [AAE 2228]**

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

**A**

**Answer all the questions.**

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

| | | | |
|---|---|---|---|
| 1) | | Discuss on the various factors influencing the ability of a tyre to grip the road surface during breaking. | (4) |
| | A) | | |
| | B) | Briefly discuss about different friction materials used on the driven Plate Clutches for heavy duty application. | (2) |
| | C) | Derive the expression for the effective mean radius and torque transmitted in case of a single plate clutch assuming uniform pressure intensity. | (4) |
| 2) | A) | An engine is required to power a truck having a gross weight of 40937 N. The maximum grade which the truck will have to negotiate at 32 km/hr in second gear is expected to be 15 %. The rolling resistance coefficient is 0.017 and the air resistance coefficient 0.0324 in the formula $R= KW+K_aAV^2$. The frontal area is 5.2 $m^2$. The transmission efficiency in second gear is estimated to be 80 %. Calculate the minimum power which should be available from the engine and the gear ratio in second gear if this power available at 2400 rpm and the effective radius of the wheels is 0.419 m. Calculate the maximum speed of this vehicle in top gear on level road at the same engine speed assuming a transmission efficiency of 90% in top gear. What is the gear ratio in top gear? The differential has a reduction of 3.92. | (4) |
| | B) | Explain clearly how it is made sure in a gearbox that at no time two gears are engaged simultaneously. Illustrate your answer by means of a neat sketch of an interlocking device. | (3) |
| | C) | What is an overdrive? With neat sketch, explain its construction and discuss its working and method of control. | (3) |
| 3) | | Discuss on the different types of hydraulic transmission. | (4) |
| | A) | | |
| | B) | What is equivalent weight? How it is different from gross vehicle weight? | (3) |
| | C) | State the difference between hydraulic pump and hydraulic motor. | (3) |
| 4) | | Discuss the construction and working of CVT also state its drawbacks in comparison to conventional gearbox. | (5) |
| | A) | | |
| | B) | Explain the construction and working of internal gear pump. Also mention advantages and | (3) |

disadvantages of the same.

C) What causes gear slipping? (2)

5) A friction clutch is required to transmit 33.12 kW at 2000 rpm. It is to be of single plate disc type with both sides of the plate effective, the pressure being applied axially by means of springs and limited to 6.87×104 Pa. If the outer diameter of the plate is to be 0.305 m find the required inner diameter of the clutch ring and the total force exerted by the springs. Assume the wear to be uniform and coefficient of friction 0.3. (4)

A)

B) An epicyclic gear train, as shown in Fig., has a sun wheel S of 30 teeth and two planet wheels P of teeth 50 each. The planet wheels mesh with the internal teeth of fixed gear A. The driving shaft carrying the sun wheel transmits 6 kW at 300 rpm. The driven shaft is connected to an arm which carries the planet wheels. Determine the speed of the driven shaft and the torque transmitted, if the overall efficiency is 95%. (4)

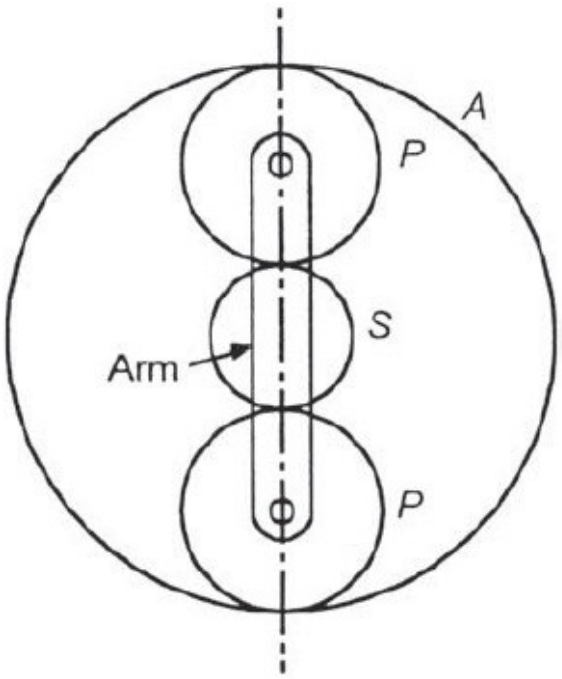


**Fig.15.27** Epicyclic gear train

C) State the difference between fluid flywheel and torque converter. (2)

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