Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (AUE)/SEM-5/AUE-504/2011-12

2011

POWER UNITS AND TRANSMISSION

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

i) Clutch plate is placed between

a) pressure plate and clutch cover

b) crankshaft and flywheel

c) flywheel and pressure plate

d) clutch cover and gear box.

ii) The gears in a constant mesh gear box have teeth which are inclined to the shaft axis. This type of gear is called

a) Spur b) Bevel

c) Worm d) Helical.

iii) The action which takes place in the clutch when the pedal is depressed is

a) pressure plate comes to rest

b) driven plate moves towards the flywheel

c) pressure plate moves away from the flywheel

d) driven plate slows down to flywheel speed.

iv) In hydrostatic transmission system

a) inlet velocity of fluid is more than outlet velocity

b) inlet velocity of fluid is less than outlet velocity

c) inlet velocity is same as that of outlet velocity

d) no relation.

v) At coupling point of torque converter

a) efficiency and speed ratio are same

b) torque ratio is 1

c) converter becomes fluid coupling

d) all of these.

vi) Stator or reactor in a torque converter is located between

a) flywheel and runner

b) runner and impeller

c) impeller and clutch plate

d) runner and pressure plate.

vii) Efficiency of fluid coupling is maximum when slip is

a) 100%

b) 10%

c) 0%

d) 2%.

viii) Multi-stage torque converter has

a) multiple impellers

b) multiple runners

c) multiple stators

d) multiple torque converters.

ix) In four speed epicyclic gear train, the number of gear unit(s) is

a) one

b) three

c) two

d) four.

x) In hydrodynamic drive, power is transmitted due to

a) change in pressure

b) change in velocity

c) change in potential energy

d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What is a synchronizing device ? How does this device help smooth gear engagement ? 1 + 4

3. Draw a neat sketch of a semi-centrifugal clutch. Explain its construction and operation. 2 + 3

4. Draw a neat sketch of a multistage torque converter. Explain its construction and working principle. 2 + 2 + 1

5. Explain the terms 'design point' and 'coupling point' of torque converter. What happens when speed ratio is more than coupling point speed ratio ? 3 + 2

6. In a gear box the clutch shaft pinion has 14 teeth and low gear main shaft pinion 32 teeth. The corresponding lay shaft pinions have 36 teeth and 18 teeth. The axle ratio is 3·7 : 1 and effecive radius of the rear tyre is 35·5 cm. Calculate the car speed in the above arrangement at an engine speed of 2500 r.p.m.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) Assuming uniform wear, derive the relationship for maximum torque capacity of clutch with usual notation. 5

b) A single plate dry disc clutch having both sides of the plate effective is tob designed for a car engine rated at 13·3 kW giving a maximum torque of 122 Nm. The coefficient of friction is 0·35, the axial pressure is not to exceed 82·9 kPa and the external radius of the friction surfaces is 1·25 times the internal radius. Find the dimensions of the friction lining and the total axial pressure that must be exerted by the spring. Prove the formula used, if any. 5

c) What are the components of single plate coil spring clutch assembly ? Explain their function. 5

8. a) Draw a neat sketch of a three forward and one reverse speed constant mesh gear box. 5

b) A car weighs 813 kg and its engine develops 20 HP and 2500 r.p.m. At this engine speed, the road speed of the car on the top gear is 64·37 kmph. Bottom gear ratio is 3·5 :1 and the efficiencies of transmission are 88% and 80% on top and bottom gears respectively. The diameter of tyres is 0·762 m and the projected area of the vehicle is 1·116 m^2 . The coefficient of air resistance is 0·0032 and road resistance is 0·023. Calculate

i) speed of the car in bottom gear

ii) tractive effort available of the wheels on top and bottom gears

iii) gradient which it can climb on the bottom gear

iv) the tractive effort of wheels required to start the car on load and attain a speed of 48·28 kmph in 10 sec. $4 \times 2\frac{1}{2}$

9. Write short notes on any *three* of the following : 3×5

a) Fluid flywheel

b) Modified Ward-Leonard control system of electric drive

c) Working of gear shifting mechanism for floor shift gear box and column shift gear box

d) Wilson planetary gear box.

10. a) Describe Janny hydrostatic transmission system with a neat sketch. 8

    b) Describe, how the different gear ratios are obtained in a planetary gear system. 7

11. a) What are the advantages and disadvantages of torque converter ? 4

    b) Explain the principle of operation of torque converter with a sketch. 6

    c) Draw the torque ratio *vs* speed ratio performance chart. 5