School of Engineering and Applied Science (SEAS), Ahmedabad University

Name: _____ Roll no.: _____

B. Tech. (Mechanical): Semester VII
Automobile Engineering (MEC510): Mid Term Exam (Monsoon Sem.:2023);
Marks: 40 M, Wt.: 40 %; September 18, 2022, Monday, 8:00 AM – 10:00 AM

Instructions:

1 All sections are compulsory.
2 Figures to right indicate full marks.
3 All acronyms carry their usual meaning.
4 Assume suitable data wherever necessary and specify it clearly in your answers.

Answer the Questions

Q-1: In case of centrifugal clutch, upto certain engine speed, the vehicle will not move, why? (2)

Q-2: Arrange the following components as per the power flow direction from Engine (1)

1. Axles
2. Gearbox
3. Clutch
4. Differential
5. Propeller shaft

A. 1-2-3-4-5
B. 3-2-5-4-1
C. 3-4-2-5-1
D. 3-2-4-5-1

Q-3: Arrange as per the power transmission sequence, (1)

1. Output shaft
2. Counter shaft
3. Dog clutch
4. Clutch shaft
5. Engine

A. 5-2-3-4-1
B. 5-3-2-4-1
C. 5-4-2-3-1
D. 5-2-4-3-1

Q-4: Modern cars have _____gearbox. (1)

A. sliding mesh
B. constant mesh
C. synchromesh

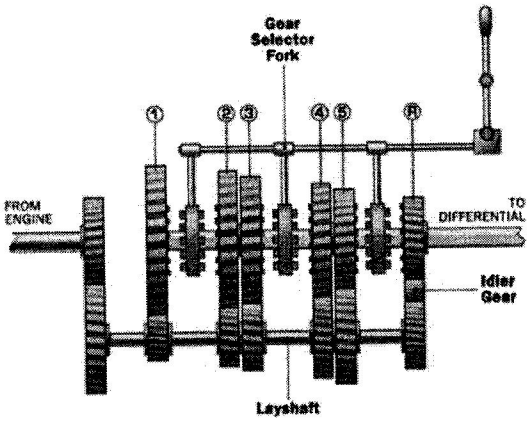
Q-5: Why the Dual Clutch Transmission has higher power and efficiency as compared to manual transmission? (1)

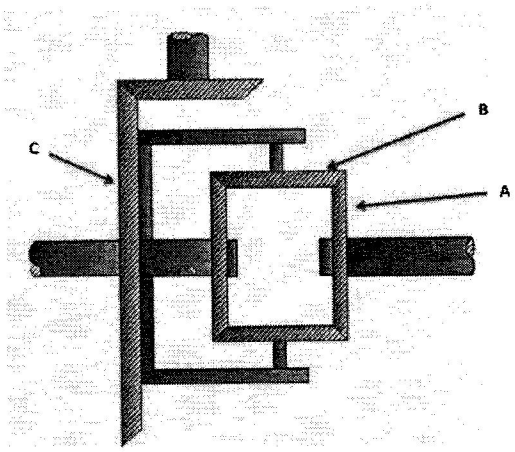
Q-6: How many gear ratios are available for the sliding mesh gear box? (0.5)

Q-7: How many gear ratios are possible for the CVT system? (0.5)

Q-8: _____drive has better towing capacity and _____drive has better vehicle handling on hilly road conditions. (front wheel/ rear wheel) (1)

Q-9: Explain how the gear change is happening from 2th gear to 3th gear with respect to the given diagram of gear box? (2)





Q-10: Identify the A, B and C from the differential gear figure. (1.5)

Q-11: What is the meaning of understeer? (1)

Q-12: Which of the following two ignition systems has higher reliability? (1)

A. Battery coil ignition system

B. Magneto ignition system

Q-13: In case of reverse gear, if the engine shaft is rotating clockwise, what will be the direction of idler gear? (1)

Q-14: Audi has _____ ignition system. (0.5)

Q-15: A four-stroke CI engine of 3.5 litre capacity develops indicated power on average of 12 kW/m3 of free air induced per minute, while running at 3300 rpm and having volumetric efficiency of 85 percent, referred to free air conditions of 1 bar and 30°C. A blower driven mechanically from the engine is proposed to be installed for supercharging. It works through a pressure ratio of 1.9 and has an isentropic efficiency of 80 percent. The increased indicated power due to increased induction is 8 kW. Taking all mechanical efficiencies to be 100 percent, estimate the volume of charge after supercharging, mass of air delivered by the compressor and the net increase in brake power of the engine due to supercharging. Take γ of the air as 1.4 and Cp = 1 kJ/kg-K. (10)

Q-16: A diesel engine is fitted with a turbocharger which comprises a radial compressor driven by a radial exhaust gas turbine. The air is drawn into the compressor at a pressure of 1 bar and a temperature of 30°C and is delivered to the engine at a pressure of 2 bar. The engine operates on an air-fuel ratio of 18 and the exhaust leaves the engine at 600°C and 1.9 bar. The turbine exhausts at 1.06 bar. The isentropic efficiencies of the compressor and turbine are 90%. Taking Cp = 1.01 kJ/kgK and γ = 1.4 for air and Cp = 1.15 kJ/kgK and γ = 1.33, determine (a) the temperature of air leaving the compressor (b) the temperature of the gases leaving the turbine (c) the net power available through turbocharger. Take mass of air as 1 kg/s. (6)

Q-17: For a single cylinder, two stroke, oil engine working on a diesel cycle, following information is provided:

Fuel consumption = 10.2 kg/h, CV of fuel = 43890 kJ/kg, speed = 1900 rpm, cooling water temperature rise =36°C, exhaust gas temperature = 400°C, room temperature = 20°C, Cp of exhaust gases = 1 kJ/kgK.

Heat carried away by cooling water is 30%, unaccounted losses are 15%, heat absorbed by brake power is 30%. Calculate heat carried away by exhaust, air consumption in kg/min, torque on the brake drum and quantity of cooling water. (7)

Q-18: Explain the working principle of the battery coil ignition system. (refer the figure) (2)

