Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Automobile Engineering **Semester: VI**
Program: B.Tech – Mechanical Engg **Time: 3 hours**
Course Code: MEAD3010P **Max. Marks: 100**
No. of Pages: 03
Note: USE of design data handbook is allowed during the examination.
Assume any suitable data if missing.

SECTION A
(5Qx4M=20Marks)

Q No	**Attempt all questions.**	**Marks**	**CO**
Q 1	Explain the uniform pressure theory. Calculate the frictional torque for single plate clutch.	**4**	**CO3**
Q 2	Explain the ignition system working with diagram.	**4**	**CO1**
Q 3	Differentiate between Cast wheel and Alloy steel wheel used in cars.	**4**	**CO1**
Q 4	Differentiate between the working of flywheel and governor.	**4**	**CO1**
Q 5	Explain the Davis and Ackerman steering mechanism used for steering system.	**4**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	A petrol engine working on Otto cycle has maximum pressure of 50 bar. Heat supplied is 1000kJ/ kg. If the pressure ratio during compression is 12.286, find the compression ratio and also the ratio of peak temperature to inlet temperature. Take p_1= 1 bar and T_1= 27^0 C.	**10**	**CO3**
Q 7	An automotive single-plate clutch, with two pairs of friction surfaces, transmits 300 N-m torque at 1500 rpm. The inner and outer diameters of the friction disk are 170 and 270 mm respectively. The coefficient of friction is 0.35. The normal force on the friction surfaces is exerted by nine helical compression springs, so that the clutch is always engaged. The clutch is disengaged when the external force further compresses the springs. The spring index is 5 and the number of active coils is 6. The springs are made of patented and cold drawn steel wires of Grade 2. (G = 81 370 N/mm^2). The permissible shear stress for the spring wire is 30% of the ultimate tensile strength. Design the springs and specify their dimensions.	**10**	**CO2**
Q 8	Explain following; (i) Rigid axle front suspension system. (ii) Explain Macpherson strut type suspension system.	**10**	**CO2**
Q 9	Explain the working of Electromagnet braking system with suitable diagram. Also	**10**	**CO1**

enlist its the components

OR

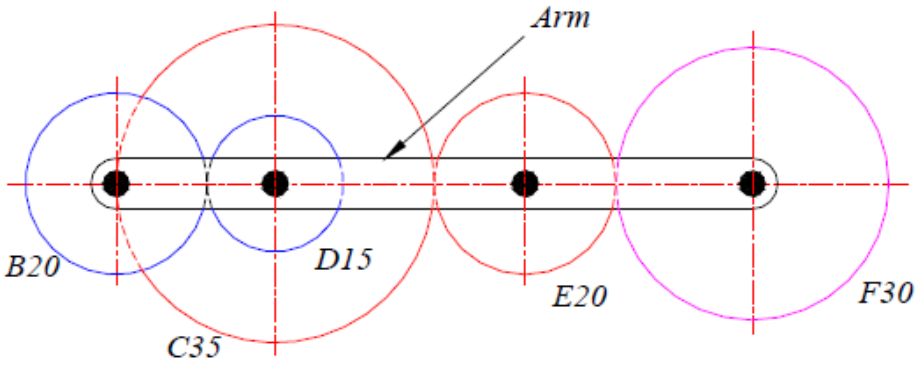
Following data is given for a caliper disk brake with annular pad, for the front wheel of the motorcycle:
torque capacity = 2000 N-m
outer radius of pad = 200 mm
inner radius of pad = 150 mm
coefficient of friction = 0.30
average pressure on pad = 2 MPa
number of pads = 2
Calculate the angular dimension of the pad.

SECTION-C (2Qx20M=40 Marks)

There is internal choice in Q No 11.

Q 10 (i) Construct the ray Diagram and kinematic diagram to design the 6 speed gear box for maximum speed of 1200 rpm and minimum speed of 400 rpm. Consider input power 10 kW at 1000 rpm. (10)

(ii) The fig shows an Epicyclic gear train. Wheel E is fixed and wheels C and D are integrally cast and mounted on the same pin. If arm A makes one revolution per sec (Counter clockwise) determine the speed and direction of rotation of the wheels B and F.. (10)



20 **CO3**

Q 11 A rotor has the following properties.

Mass magnitude	Radius	Angle	Axial distance from first mass 1
9 kg	100 mm	$\theta_A = 0$	0
7 kg	120 mm	$\theta_B = 60$	160 mm
8 kg	140 mm	θc = 135	320 mm
6 kg	120 mm	$\theta_D = 270$	560 mm

If the shaft is balanced by two counter masses located at 100 mm radii and revolving in planes midway of planes 1 and 2, and midway of 3 and 4, determine the magnitude of the

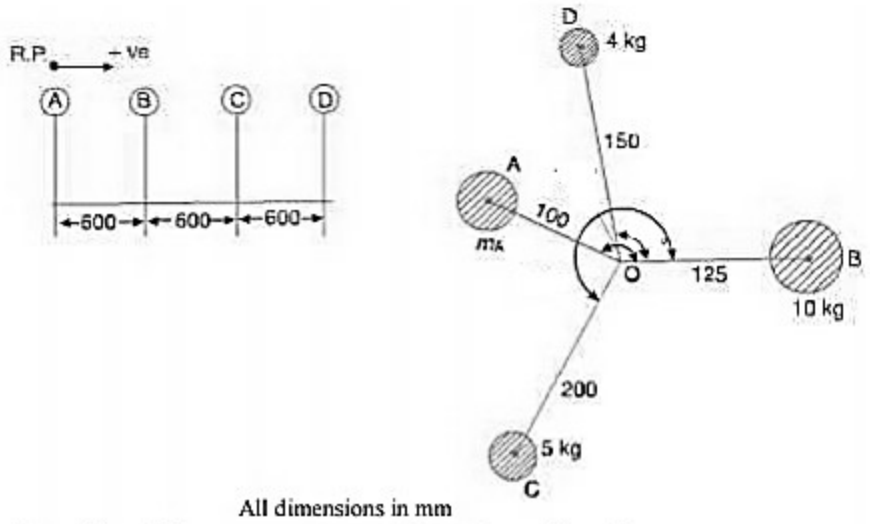
20 **CO1 CO3**

masses and their respective angular positions.

OR

(i) Explain the wheel balancing.

(ii) A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The planes in which the masses revolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively. Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance. *Assume angular position of mass B as 0^0 and plane of mass A as Reference plane.*



All dimensions in mm

(*a*) Position of planes. (*b*) Angular position of masses.