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B.E. / B.TECH. DEGREE EXAMINATIONS, DEC 2019
Sixth Semester
AE16601 – AUTOMOTIVE ENGINE COMPONENTS DESIGN
(Automobile Engineering)
(Regulation 2016)

Time: Three Hours

Maximum : 100 Marks

Answer ALL questions

PART A - (10 X 2 = 20 Marks)

	CO	RBT
1. Define Factor of safety.	1	R
2. What is notch sensitivity?	1	U
3. What are the stresses induced in the connecting rod?	2	U
4. Under what force, the big end bolts and caps are designed?	2	U
5. What are the materials used in the manufacture of crankshafts?	3	U
6. What is meant by firing order?	3	R
7. Define coefficient of fluctuation of speed of a flywheel.	4	R
8. Define radius of gyration.	4	R
9. Name the commonly used materials for engine valves.	5	R
10. Why the area of the inlet valve port is made larger than the area of exhaust valve port?	5	U

PART B - (5 X 16 = 80 Marks)

11. (a) Explain Interchangeability and Allowance with examples. (16) 1 U
(OR)
(b) Enumerate any eight important physical and mechanical properties of engineering materials with examples. (16) 1 U
12. (a) Design a cast iron piston for a single acting four stroke engine for the following data: (16) 2 AN
Cylinder bore = 100 mm, Stroke = 125 mm, Maximum gas pressure = 5 N/mm², Indicated mean effective pressure = 0.75 N/mm², Mechanical efficiency = 80%, Fuel consumption = 0.15 kg per brake power per hour, Higher calorific value of fuel = 42 × 10³ kJ/kg, Speed = 2000 rpm.
Any other data required for the design may be assumed.
(OR)
(b) Explain in detail the steps involved in design of connecting rod. (16) 2 U
13. (a) Explain the various types of crankshafts with neat sketches and discuss the steps involved in design of overhung crankshaft when the crank is at dead centre. (16) 3 U

(OR)

- (b) Design a plain carbon steel centre crankshaft for a single acting four stroke single cylinder engine for the following data: (16) 3 AN
 Bore = 400 mm, Stroke = 600 mm, Engine speed = 200 rpm, Mean effective pressure = 0.5N/mm^2 , Maximum combustion pressure = 2.5N/mm^2 , Weight of flywheel used as a pulley = 50 kN, Total belt pull = 6.5 kN. When the crank has turned through 35° from the top dead centre, the pressure on the piston is 1N/mm^2 and the torque on the crank is maximum. The ratio of the connecting rod length to the crank radius is 5. Assume any other data required for the design.
14. (a) A single cylinder, single acting, four stroke oil engine develops 20 kW at 300 rpm. The workdone by the gases during the expansion stroke is 2.3 times the workdone on the gases during the compression and the workdone during the suction and exhaust strokes is negligible. (16) 4 AN
 The speed is to be maintained within $\pm 1\%$. Determine the mass moment of inertia of the flywheel.
- (OR)**
- (b) Explain the procedure for determining the size and mass of a flywheel used in multi-cylinder engine with the help of a turning moment diagram. (16) 4 U
15. (a) Design a rocker arm for the exhaust valve of a four-stroke engine using the following data: (16) 5 AN
 Effective length of each arm = 180 mm, Angle between two arms = 135° , Diameter of valve head = 75 mm, Lift of valve = 25 mm, Mass of valve = 0.5 kg, Engine speed = 600 rpm, Back pressure when the exhaust valve opens = 0.4 MPa, Maximum suction pressure = 0.02 MPa below Atmosphere. The valve opens 33° before the outer dead centre and closes 1° after the inner dead centre. The motion of the valve is SHM without dwell in the fully opened condition. Assume suitable data and state the assumptions you make.
- (OR)**
- (b) Design a cam for operating the exhaust valve of an oil engine. It is required to give equal uniform acceleration and retardation during opening and closing of the valve each of which corresponds to 60° of cam rotation. The valve must remain in the fully open position for 20° of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 40 mm. The follower is provided with a roller of radius 20 mm and its line of stroke passes through the axis of the cam. (16) 5 AN