

Name:	
Enrolment No:	

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2018**

**Course: ADEG 431 / Automotive Engine components design** Semester: VII  
**Programme: B.tech / ADE**  
**Time: 03 hrs.** Max. Marks: 100  
**Instructions: Assume suitable value for any missing data**

**SECTION A**

*(Attempt all questions. All questions carry equal marks)*

S. No.		Marks	CO
Q 1.	Discuss the general design considerations of engine components.	4	CO1
Q 2.	State the role of flywheel and governor.	4	CO5
Q 3.	List out with suitable block diagram the general design procedure of engine components.	4	CO1
Q 4.	State the types of stresses induced in rim flywheel, connecting rod and crankshaft.	4	CO3,2,5
Q 5.	Define the term the fluctuation of energy and co efficient of fluctuation of energy.	4	CO5

**SECTION B**

*(Attempt all questions. All questions carry equal marks)*

Q 6.	<p>A four-stroke single cylinder gas engine runs at a constant load and it delivers 25kw at 300 rpm. The maximum fluctuation of energy per cycle taken as 0.65 times of the useful work done per cycle. The coefficient of fluctuation of speed id 0.04. The flywheel is made of cast iron and its limiting speed is 25 m/s and <math>\rho=7500 \text{ kg/m}^3</math>. Find the mass, diameter cross section of the flywheel rim.</p> <p style="text-align: center;">(Or)</p> <p>A multi cylinder engine is to run at constant load at a speed of 500 rpm on drawing the crank effort diagram to scale of 1 cm = 2500 Nm and 1 cm = 60°; the area above and below the mean torque line were measured and found to be in order +1.60, -1.72, +1.68, -1.91, +1.97 and -1.62. If the speed is within the limits of <math>\pm 1\%</math> of the mean speed, design the suitable type of flywheel. Take <math>\rho=7500 \text{ kg/m}^3</math>; <math>\sigma_t = 6\text{MPa}</math></p>	10	CO4
Q 7.	The cylinder of low speed engine is 200 mm in diameter and the steam pressure is 0.875MPa. The connecting rod is 1 m long and is of rectangular cross section. Width is 2 times of the thickness. Find the dimensions of the cross section. Assume stress value of mild steel $\sigma_c = 330 \text{ MPa}$ ; $C = 1/7500$ and F.O.S. = 6.	10	CO2
Q 8.	In a spring loaded Hartnell governor, the extreme radii of rotation of balls are 85mm and 125mm; the ball arm and sleeve arm of the bell crank lever are equal in length. The mass of each ball is 2 kg. If the speeds at the two extreme positions are 420 and	10	CO5

	440 r.p.m. Find the Initial compression of the central spring and the spring constant.		
Q 9.	Find the main dimensions of exhaust valve of an IC engine power is 25kw at 500 r.p.m. cylinder bore is 300 mm and stroke is 450mm; mean effective pressure of the engine is 0.35 N/mm <sup>2</sup> . The angle at which the valve seat tapered is 35°. Determine the dimensions of the valve by assuming double valve system.	10	CO4
<b>SECTION-C</b> <i>(Attempt all questions. All questions carry equal marks)</i>			
Q 10.	<p>Design a crank shaft for single acting four stroke, single cylinder engine for the flowing data:</p> <p style="padding-left: 40px;">Piston diameter = 200 mm Stroke = 400 mm Maximum combustion pressure = 2.0 N/mm<sup>2</sup> Weight of the flywheel = 15 kN Total belt pull = 3kN Length of the connecting rod = 900 mm</p> <p>When the crank has turned through 30° from top dead center, the pressure on the piston is 1 N/mm<sup>2</sup> and the torque on the crank is maximum. Distance between the main bearings of the crank is 350 mm respectively. Assume any other data required for the design.</p> <p style="text-align: center;">(Or)</p> <p>Design an overhung crankshaft for an I.C. engine for the flowing data. Stroke is 250 mm; cylinder bore is 200 mm; length to connecting rod is five times the crank radius; maximum gas pressure is 2.2 N/mm<sup>2</sup>; gas pressure when the torque is maximum is 1.1 N/mm<sup>2</sup>; and the crank angle when the torque is maximum is 30°. Assume any other suitable data.</p>	20	CO4
Q 11.	Design the connecting rod for a petrol engine with the following data: Bore is 100 mm; stroke is 250 mm; Length of connecting rod is 300 mm; compression ratio is 6:1; speed is 1650 r.p.m. maximum explosion pressure is 2 N/mm <sup>2</sup> ; Select the suitable material for the connecting rod. Assume any other missing data.	20	CO2