**Karunya University**

**(Karunya Institute of Technology and Sciences)**

(Declared as Deemed to be University under Sec.3 of the UGC Act, 1956)

**Supplementary Examinations – June 2016**

**Subject Title: DESIGN OF MACHINE ELEMENTS Time : 3 hours**

**Subject Code: 14ME2029 Maximum Marks: 100**

**Answer ALL questions (5 x 20 = 100 Marks)**

1. **Compulsory:**  
 a. What are the factors influencing machine design? (10)

b. What are the factors influencing selection of materials? (10)

2. Design a spring for spring loaded safety valve for the following conditions: Operating pressure 100 N/cm2. Diameter of valve seat 100 mm. Design shear stress for the spring is 400 N/mm2. Modulus of rigidity is 0.86 ×105 N/mm2. The spring is to be kept in a casing of 120 mm inner diameter and 400 mm long. The spring should be at maximum lift of 6 mm when the pressure is 107.5 N/cm2.

**(OR)**

3. Design a spindle for a milling machine to transmit power from motor to the cutter. Maximum power to be transmitted is 5 H.P at 800 r.p.m. The angular deflection of the shaft for this service should not exceed 0.25o per meter length of the spindle. Material used is 20 Mn 2 steel. Modulus of rigidity of the material is 0.84 ×105 N/mm2. Determine also shear stress in the shaft.

4. Design a cotter joint to withstand an axial load varying from 60 kN in tension to 60 kN in compression. Allowable stresses for the steel used in the joint are 60 N/mm2 in tension and 75 N/mm2 in crushing and 48 N/mm2 in shear.

**(OR)**

5. Design a knuckle joint to withstand a tensile load of 60 kN using steel with the following permissible stresses: 62.5 N/mm2 in tension and 75 N/mm2 in crushing and 50 N/mm2 in shear.

6. Design a Cast Iron piston for single acting four stroke engine for the following specifications. Cylinder bore = 100 mm, Stroke = 120 mm, Maximum gas pressure = 5 N/mm2, Brake mean effective pressure = 0.65 N/mm 2, Fuel consumption = 0.23 kg/kW/hr, Speed =2200 rpm.

**(OR)**

7. Design a connecting rod for an I.C. engine for the following data, Piston diameter = 125 mm, Stroke = 150 mm, Length of connecting rod = 300 mm, Maximum gas pressure at 5% of stroke = 5 N/mm2, Speed of engine = 1200 rpm, Mass of reciprocating parts = 2 kg, Factor of safety= 5, Material steel = 35 Ni Cr 60.

8. Design a overhung crank shaft for a steam engine to the following specifications: Diameter of piston = 400 mm, Stroke of piston = 600 mm, Maximum steam pressure = 10 N/mm2, Speed of the engine = 100 rpm, Distance of bearing from crank= 350 mm, Design shear stress for crank shaft and crank pin = 35 N/mm2, Design tensile stress for crank shaft and key = 66 N/mm2.

**(OR)**

9. Design a Cast Iron flywheel for a four stroke engine developing 75 kW at 300 rpm in order the speed variation may be limited to ±2.5%. The work during power stroke is 1.35 times the average work done during whole cycle. The peripheral speed is limited to 30 m/s. Design shear for the shaft and key are 40 N/mm2. Design tensile stress for Cast Iron is 10 N/mm2.