

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**SIXTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MAY 2019**

**Course Code: ME 314**

**Course Name: MACHINE DESIGN II**

Max. Marks: 100

Duration: 3 Hours

**INSTRUCTIONS**

- Recommended Design data book is allowed for the examination
- Suitably assume any data not provided

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

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|---|--|------|
| 1 | a) Explain the Shigley's design process with a neat flow chart   | (5)  |
|   | b) Why do we require different theories of failure? List down the different theories of failures, its statements and equations   | (10) |
| 2 | a) A steel shaft 0.9m long between bearings receives 18kW power @900 rpm through a 20° involute gear of 2mm module and 100 teeth located at 250mm to the left of left bearing and is driven by a gear placed directly behind it. The power is transmitted by a 400mm diameter pulley to another pulley placed towards its front placed at an angle of 45° to horizontal. The pulley is located at a distance of 300mm to the left of right bearing. The tension ratio is 2.7. Design a rigid shaft taking the allowable shear stress as 72MPa. | (15) |
| 3 | a) A line shaft rotating at 200rpm is to transmit 20kW. The shaft may be assumed to be made of Mild steel 40C8. Considering a factor of safety of 7, determine the diameter of the shaft neglecting the bending moment   | (5)  |
|   | b) A shaft supported at the ends in ball bearings carries a straight tooth spur gear at its mid span and is to transmit 7.5kW at 300rpm. The PCD of the gears is 150mm and is located at a distance of 100mm from bearings. Taking the allowable shear stress as 45MPa, determine the diameter of the shaft  | (10) |

**PART B**

*Answer any two full questions, each carries 15 marks.*

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|---|---|------|
| 4 | a) A multiplate clutch with steel and bronze plates is to transmit 8kW at 1440 rpm. The inner and outer diameters of contact are 80mm and 140mm respectively. Assuming uniform wear, determine the number of steel and bronze plates. | (15) |
| 5 | a) A 80mm long journal bearing supports a load of 2800N on a 50mm diameter shaft.   | (15) |

The bearing has a radial clearance of 0.05mm and the viscosity of oil is 0.021kg/m-s at the operating temperature. If the bearing is capable of dissipating 80J/s, determine the maximum safe speed

- 6 a) A truck spring has 12 leaves, two of which are full length leaves. The spring supports are 1.05m apart and the central band is 85mm wide. The central load is to be 5.4kN with A permissible stress of 280MPa. Determine the thickness and width of the steel spring leaves. The ratio of total depth to the width of spring is 3. Also determine the deflection of the spring. (15)

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Design a pair of spur gears to transmit 18kW at 3000rpm. The velocity ratio required is 6:1. The design should be as compact as possible. (20)
- 8 a) A worm drive transmits 15kW @2000rpm to a machine carriage at 75rpm. The worm is triple threaded and has 65mm pitch diameter. The worm gear has 90 teeth of 6mm module. The tooth form is 20° full depth involute. The coefficient of friction can be taken as 0.1. Calculate 1. Tangential force acting on worm; 2. Axial thrust and separating force on worm; 3. Efficiency of worm drive (20)
- 9 a) Why is the cross section of the connecting rod preferred as I section? With a neat sketch, provide the dimensions based on thickness for the connecting rod 5
- b) Design a connecting rod for an IC engine running at 1800 rpm and developing a maximum pressure of 3.15 MPa. The diameter of the piston is 100mm, mass of reciprocating parts per cylinder is 2.25kg, length of connecting rod 380mm, stroke of piston 190mm and the compression ratio 6:1. Take factor of safety as 6. The density of the material to be taken as 8000kg/m<sup>3</sup> and the allowable stress in the bolts and the cap as 60MPa and 80MPa respectively. Take the cross section as I section 15

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