| O.P.Code: 20ME0320 | R20 | H.T.No. | | | | | | | | | |
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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**

(AUTONOMOUS)

B.Tech III Year II Semester Regular Examinations August-2023

**DESIGN OF MACHINE ELEMENTS-II**

(Mechanical Engineering)

**Time: 3 Hours** **Max. Marks: 60**

(Answer all Five Units **5 x 12 = 60** Marks)

**UNIT-I**

| | | | | | |
|---|---|---|---|---|---|
| **1** | **a** | Design a spring for a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 kN/mm$^2$. Also calculate the maximum shear stress induced. | **CO4** | **L6** | **6M** |
| | **b** | Classify springs according to their shapes. Draw neat sketches indicating in each case whether stresses are induced by bending or by torsion. | **CO4** | **L4** | **6M** |

**OR**

| | | | | | |
|---|---|---|---|---|---|
| **2** | | Design a valve spring for an automobile engine when engine valve is closed, the spring produces a force of 44 N and when valve open, produces a force of 54 N. The spring must fit over the valve bush which has an outside diameter of 20 mm and must go inside a space of 35 mm.The lift of the valve is 6 mm. The spring index is 12. The allowable stress may be taken as 325 N/mm2. Modulus of rigidity may be assumed as 80 × 10$^3$ N/mm$^2$. | **CO4** | **L4** | **12M** |

**UNIT-II**

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| **3** | | Design a journal bearing for centrifugal pump from the following data:<br>Load on the journal = 20 kN<br>Speed of the journal = 900 rpm<br>Type of oil SAE 10 for which absolute viscosity at 55°C = 17 centipoises<br>Ambient temperature of oil = 15.5°C<br>Maximum bearing pressure for the pump = 1.5 N/mm$^2$<br>Calculate also the mass of the lubricating oil required for artificial cooling to rise in temperature of the oil limited to 10°C. Heat dissipation coefficient = 12.2 kN/m2/°C | **CO2** | **L5** | **12M** |

**OR**

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| **4** | | Select a suitable spherical roller bearing from SKF series 222C to support a radial load of 4kN and axial load of 2kN. Minimum life required is 10000 hrs at 1000 rpm. For this select bearing find<br>(i) The expected life under the given loads<br>(ii) The equivalent load that can be supported with a probability of survival of 95% with 10000 hours. | **CO2** | **L5** | **12M** |

**UNIT-III**

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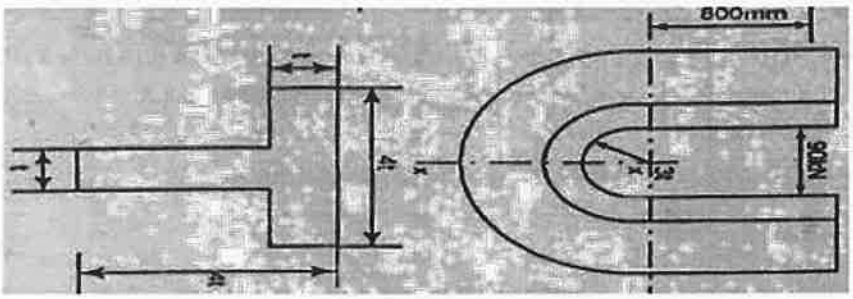
| **5** | | A punch press of capacity 90KN has a c-frame of T- cross section as shown in fig. The frame is made of a material with an ultimate tensile stress of 400MPa for a factor of safety of 3.5, determine the dimensions of the frame. | **CO1** | **L5** | **12M** |




**OR**

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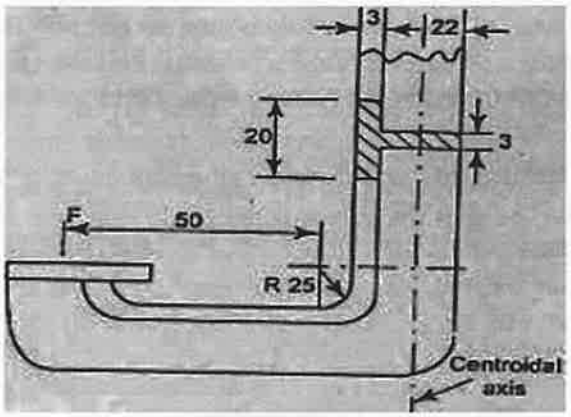
| 6 | A C- clamp is to bear the force' F' applied on to it. It has a T-section as shown in fig. if the maximum tensile strength in the clamp is limited to 130MPa. Find 'F'. | CO1 | L5 | 12M |




**UNIT-IV**

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| 7 | In a spur gear drive for a rock crusher, the gears are made of case hardened alloy steel. The pinion is transmitting 18 kW at 1200 rpm with a gear ratio of 3.5. The gear is to work 8 hours/day for 3 years. Design the drive. | CO5 | L3 | 12M |

**OR**

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|---|---|---|---|---|
| 8 | A compressor running at 350 rpm is driven by 5 kW, 1400 rpm motor through 200 full depth spur gears. The motor pinion is to be of C30 forged steel hardened and tempered, and the driven gear is to be of cast iron grade 35. Assuming medium shock condition, design the gear drive completely. Take minimum number of teeth is 18 for the pinion. The gears are working for one shift per day in an industrial atmosphere and to work for two years before their replacement. | CO5 | L3 | 12M |

**UNIT-V**

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| 9 | A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameter of the pinion and gear are 80mm and 100 mm respectively. The tooth profiles of the gear are of 14 ½ degrees composite form. The allowable static stress for both the gears is 55MPa. If the pinion transmits 2.75 kW at 1100 r.p.m., find the module and number of teeth on each gear from the standpoint of strength and check the design from the standpoint of wear.. Take surface endurance limit as 630 MPa and modulus of elasticity for cast iron as 84kN/mm$^2$. | CO5 | L3 | 12M |

**OR**

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| 10 | A triple threaded worm has teeth of 6mm module and pitch circle diameter of 50mm. If the worm gear has 30 teeth of 14 ½ degrees and the coefficient of friction of the worm gearing is 0.05, find 1.the lead angle of the worm, 2. Velocity ratio, 3. Centre distance, 4.efficiency of the worm gearing. | CO5 | L3 | 12M |

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