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**E Reg. No. :**

**Question Paper Code: 51P13**

M.E. DEGREE EXAMINATION, NOV 2017

First Semester

CAD/CAM

15PCD103- INTEGRATED MECHANICAL DESIGN

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART - A (5 x 20 = 100 Marks)

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| 1. | (a) | The load on a bolt consists of an axial pull of 10 kN together with a transverse shear force of 5kN.Calculate the diameter of bolt required according to  (i)Maximum principal stress theory  (ii)Maximum shear stress theory  (iii)Maximum Principal strain theory  (iv)Maximum strain energy theory  (v)Maximum distortion energy theory | CO1- U | (20) |
|  |  | Or |  |  |
|  | (b) | Taking stress concentration in to account find the maximum stress induced when a tensile load of 20KN is applied to  (i) Rectangular plate80mm wide and 12mm thick with a  transverse hole of 16mm diameter.  (ii) Stepped shaft of diameters 60mm and 30mm width a fillet  Radius of 6mm. | CO1- App | (20) |
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| 2. | (a) | A cylindrical shaft made of steel of yield strength 700 MPa and is subjected to static Bloads consisting of bending moment 10kN-m and a torsion moment 30kN-m.Predict the diameter of the shaft using two different theories of failure and assuming a factor of safety of 2.Take E=210 GPa and Poisson ratio=0.25 | CO2- App | (20) |
|  |  | Or |  |  |
|  | (b) | Design a line shaft transmitting power to two machine tools. The power received by the shaft is 30kw at 300rpm. The power absorbed by the pulley P1 is 12kwand the remaining power is absorbed by the pulleyP2. The diameter of pulley P1 is300mm and its mass is 40kg. The diameter and mass of pulley P2 are 600mm and 75kgrespectively. Assume the belt tension ratio of 2 for both pulleys and shaft material as30C8 steel with Km=2 and Kt=1.5. Draw the bending moment and torque diagrams, assuming shear, stress theory. | CO2- Ana | (20) |
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| 3. | (a) | In a spur gear drive for a stone crusher, the gears are made of C40 steel. The pinionis transmitting 30 KW at 1200 rpm. The gear ratio is 3. Gear is to work 8 hours per day, six days a week and for  3 years. Design the drive. | CO3- Ana | (20) |
|  |  | Or |  |  |
|  | (b) | Design a straight spur gear drive to transmit 8 kW. The pinion speed is 720 rpm and thespeed ratio is 2. select suitable material for pinion and wheel. | CO3- Ana | (20) |
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| 4. | (a) | A double shoe brake is capable of absorbing a torque of  1400N-m.The diameter of the brake drum is 350mm and the angle of contact for each shoe is 1000.If the co-efficient of friction between the brake drum and lining is 0.4,Calculate  1.The spring force necessary to set the brake and  2.the width of the brake shoes, if the bearing pressure on the lining material is not to exceed0.3 N/mm2 | CO4- App | (20) |
|  |  | Or |  |  |
|  | (b) | A differential band brake has an angle of contact of 2250.The band has a compressed woven lining and bears against a cast iron drum of 350mm diameter. The brake is to sustain a torque of350N-m and the co-efficient of friction between the band and the drum is 0.3. Predict  a) The necessary force(P) for the clockwise and anticlockwise rotation of the drum and  b) The value of length of differential lever for the brake to be self locking, when the drum rotates clockwise. | CO4- App | (20) |
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| 5. | (a) | Explain the steps involved in designing a 12 speed gear box for a Gear hobbing Machine spindle rotating at a speed ranging from 200 rpm to 1250 rpm. Assume all are spur gears. Design the kinematic arrangement , gear, gear box and layout. | CO5- Ana | (20) |
|  |  | Or |  |  |
|  | (b) | Illustrate the design of a 9 speed gear box for a centre grinding machine spindle rotating at a speed ranging from 300 rpm to 1550 rpm. Assume all are spur gears. Design the kinematic arrangement, gear, gear box and layout. | CO5- Ana | (20) |
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