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7TH SEMESTER   B.Tech Part Time (ME)

END SEMESTER EXAMINATION (Supplementary) *Feb -2019*

CME403 & Machine Design

Time: 3:00 Hours   *Max. Marks : 40*

> **Note :** Answer any five questions.
> All questions carry equal marks. Assume suitable missing data, if any. Design Data H/Book is allowed

Q.1 [a] Explain the procedure for selection of factor of safety for a piston of an IC engine. [2]

[b] What are different types of variable stresses? [2]

[c] Explain distortion energy theory of failure. [2]

[e] Define stress concentration. How localised stresses in machine component be avoided? Explain with diagrams. [2]

Q.2 A journal of nominal or basic size of 75 mm runs in a bearing with close running fit designated as H8g7. Find the limits of shaft and bearing. What is the maximum and minimum clearance? Explain the fit completely. [8]

Q.3 A simply supported beam has a concentrated load at the centre which fluctuates from a value of P to 4 P. The span of the beam is 500 mm and its cross-section is circular with a diameter of 60 mm. Taking for the beam material an ultimate stress of 700 MPa, a yield stress of 500MPa, endurance limit of 330 MPa for reversed bending, and a factor of safety of 1.3, calculate the maximum value of P. Take a size factor of 0.85 and a surface finish factor of 0.9. [8]

P.T.O.

Q.4 Design a simple cotter joint for an axial load of 100kN. Assume that all the parts are made of same material with permissible stresses of 70MPa, 50MPa and 90MPa in tension, shear and compression respectively. [8]

Q.5 A pair of straight teeth spur gears, having 20° involute full depth teeth is to transmit 12 kW at 300 r.p.m. of the pinion. The speed ratio is 3 : 1. The allowable static stresses for gear of cast iron and pinion of steel are 60 MPa and 105 MPa respectively. Assume the following: Number of teeth of pinion = 16; Face width = 14 times module; Velocity factor $(C_v) = 4.5/(4.5 + v)$, v being the pitch line velocity in m/s. Determine the module, face width and pitch diameter of gears. Check the gears for wear; given, $\sigma_{es} = 600$ MPa; $E_P = 200$ GPa and $E_G = 100$ GPa. [8]

Q.6 Design a rigid flange coupling for transmission of 30kW from a motor to a centrifugal pump at 1448rpm. The following data is given:
Diameter of motor shaft=38mm, Diameter of pump shaft=30mm, No. Of bolts=6 nos. Allowable Shear stress for the bolts, keys and shaft=55MPa, Allowable shear stress for the flanges=12MPa. Assume crushing stress twice the shearing stress in all cases. [8]

Q.7 Design a triple riveted butt joint with chain fashion with five rivets in one pitch length and with double cover plates of equal widths for a boiler drum of diameter ϕ1450mm and internal pressure of 1.5MPa. The allowable tensile stress, compressive stress and shearing stress of the steel used are 75MPa, 100MPa and 58MPa respectively. The efficiency of the joint should not be less than 75%. Assume that the boiler plate and rivets are made of the same steel. [8]

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