

EKS-303

B.E. VII Semester (CGPA) Mechanical Engineering Examination 2017

THEORY AND DESIGN OF MACHINE - I

Paper : M-703

Time Allowed : Three Hours

Maximum Marks : 60

Note: Attempt any five questions.

- Q.1. a) Explain importance of tolerance and inter changeability in design. 6
b) What do you mean by preliminary design and detail design. 6
- Q.2. a) Define the terms: Vibration, Isolation and Transmissibility. 6
b) Define how residual stresses are generally arise in the component? 6
- Q.3. Write short notes on following (any two) 12
i) Designing for stiffness
ii) Reliability in design
iii) Designing for vibration resistance

(2)

- Q.4. a) Distinguish between circumferential stress and longitudinal stress in a cylindrical sheet, when subjected to an internal pressure. 4
b) Find thickness for a tube of internal diameter 100mm subjected to an internal pressure which is $\frac{5}{8}$ of the value of the maximum permissible circumferential stress. Also find the increase in internal diameter of such a tube when the internal pressure is 90N/mm^2 . Take $E = 205\text{kN/mm}^2$ and $\mu = 0.29$. Neglect longitudinal strain. 8
- Q.5. a) What are the materials used for lining of friction surfaces. 4
b) A single plate clutch, effective on both sides, is subjected to transmit 25kW at 3000 rpm . Determine the outer and inner diameter of frictional surface if the coefficient of friction is 0.255 , ratio of diameters is 1.25 and the maximum pressure is not to exceed 0.1N/mm^2 . Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear. 8
- Q.6. a) What is a self energizing brake? When a brake becomes self-locking. 4
b) A flywheel of mass 100kg and radius of gyration 350mm is rotating at 720 rpm . It is brought to rest by means of a brake. The mass of the brake drum assembly is 5kg . The brake drum is made of cast iron having specific heat $460\text{J/kg } ^\circ\text{C}$. Assuming that the total heat generated is absorbed by the brake drum only, calculate the temperature rise. 8

(3)

Q.7. A power screw having double start square threads of 25mm nominal diameter and 5mm pitch is acted upon by an axial load of 10kN. The outer and inner diameters of screw collar are 50mm and 20mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.2 and 0.15 respectively. The screw rotates at 12 rpm. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8N/mm^2 . Find:

- i) The torque required to rotate the screw
- ii) The stress in the screw and
- iii) The number of threads of nut in engagement with screw

