TE MECHTRONICS / SEM-V / CBSGS / DT- 23/05/2017.

[Time: 3 Hours]   [Marks: 80]

Please check whether you have got the right question paper.

N.B:
1) Question No. **1** is **compulsory**
2) Attempt any **three** from questions No. **2 to 6.**
3) **Design data book** is permitted in exam hall.

Q. 1   Attempt any **four**

a) Write short note on the leaf spring.   05
b) Explain the energy stored in the Flywheel.   05
c) Discus the function of coupling. Give at least three practical applications. 05
d) What is summerfeld's and bearing Characteristic Number?   05
e) Explain the strength of parallel and transverse fillet welds.   05

Q. 2 a) It is design Knuckle joint to connect two steel rod of equal diameter. Each rod is subjected to an axial force of 50KN. The allowable tensile, shear and crushing stresses are 80N/mm², 40N/mm² and 80N/mm² respectively. Design the joint and specify the main dimensions.   10

b) A spring is subjected to a load vary mg from 400N to 1000N. It is to be made of oil tempered, cold wound wire, and design factor based on the wahl's line is 1.25. The spring index is to be 6.0. The free length of spring should lies ben 100 to 150mm. The compression of spring under maximum load is 30mm.   10

Determine diameter of wire and mean coil diameter of spring. Take yield stress in shear = 770 N/mm² and endurance stress in shear S'_{se} = 350 N/mm² Take G = 0.8 x 10⁵ N/mm².

Q. 3 a) Distinguish between the rigid and Flexible coupling.

A rigid coupling is used to connect a 45 KW, 1440 rpm electric motor to a centrifugal pump. The starting torque of the motor is 225% of rated torque. There are 8 bolts and their pitch circle diameter is 150mm. The both bolt are made of steel 45C8 (S_{yt} = 380 N/mm²) and the factor of safety is 2.5.

Assume (S_{sy} = 0.577 S_{yt})

Assume that the bolt one finger tight in reamed and ground hole.   10

TURN OVER

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b) A welded connection of steel plates is shown in Fig (1) It is subjected to an eccentric Force of 50KN. Determine the size of the weld. If permissible shear stress in the weld is not exceed 70 N/mm². 10
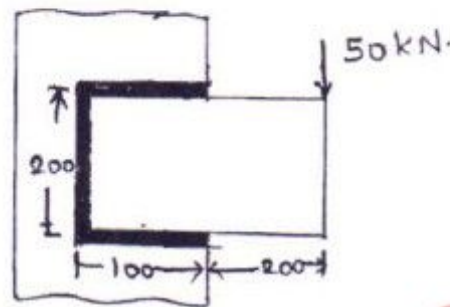

Fig : (1)

Q. 4 a) Explain the ASME code for shaft design. 06

b) The following data is given for a 360° hydro dynamic bearing:

Radial load = 10 KN

Journal speed = 1440 rpm

Unit bearing pressure = 100 K pa

Clearance Ratio (r/c) = 800

Viscosity of lubricant = 30 m pa s.

Assuring that the total heat generated in bearing is carried by the total oil flow in the bearing calculate : 14

i) Coefficient of friction;

ii) Power lost in friction

iii) Dimensions of bearing;

iv) Total Flow of oil;

v) Side leakage

vi) Temperature rise

Q. 5 a) A machme component is subjected to two-dimensional stresses. The tensile stress in X direction varies from 40 to 100 N/mm² while the tensile stress in Y direction varies from 10 to 80 N/mm². The Frequency. of variation of these stresses is equal. The corrected endurance limit of the component is 270 N/mm². The ultimate tensile strength of the material of the component is 660 N/mm². Determine the factor of safety used by the designer. 10

TURN OVER

b) The turning moment diagram for a mutli-cylinder engine has been drawn to a scale of 1cm to 5000 N-m torque and 1 cm to 60° respectively. The intercepted area between output torque curve and mean resistance taken in order from one end are:

-0.3; +4.1; -2.8; +3.2; -3.3; +2.5; -3.6; +2.8; -2.6. sq cm when the engine is running at 800 rpm.

The engine has a stroke of 30cm and the fluctuation of speed is not to exceed 2% of the mean speed.

Determine a suitable diameter and cross-section of the flywheel rim for a limiting value of the shaft centrifugal stress of 280 x 105 N/m². The material density may be Assumed as

7.2 g/cm³. Assume thickness of the rim to be $\frac{1}{4}$ of the width.   10

Q. 6 a) State and explain maximum principle stress theory failure.   06
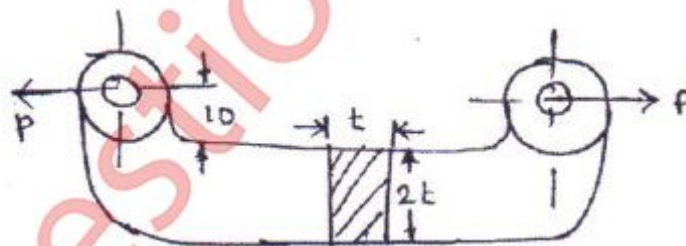
b) Explain design consideration in Forging.   06

c) An offset link subjected to a force of 25 KN is shown in Fig (2) It is made of gray cast iron   08
FG300 and factor of safety is 3. Determine the dimensions of the cross-section.

Offset link

Fig (2)