QP CODE : 25575

(3 Hours) Marks : **80**

NB : (1) Question No.1 is **compulsory**
(2) Attempt **any three** from question no. 2 to 6
(3) Use of standard design data book like Mahadevan Reddy and PSG is permitted at examination.

1. Attempt any four : **20**
   (a) Explain the terms :
      (i) Coefficient of fluctuation of speed.
      (ii) Coefficient of fluctuation of energy.
   (b) What is Wahl factor ? Why it is use ?
   (c) What is Function of keys ? Explain types of keys with suitable sketches.
   (d) Derive an expression for stribeck equation in rolling contact bearing.
   (e) What are the advantages of threaded joints over welded joints ?

2. (a) Design a cottor joint to tranmit the load of 50 KN in tension or compression. **10**
   Take the stresses as :
   Allowable crushing stress = 115 N/mm^2.
   Allowable tensile stress = 65 N/mm^2.
   Allowable shear stress = 50 N/mm^2.
   Sketch the elavation of joint showing all dimensions on it.

   (b) It is required to design a helical compression spring subjected to a force of 500N. **10**
   The deflection of spring corresponding to this force is approximately 20 mm. The spring index should be 6. The spring is made of cold-drawn steel wire with ultimate tensile strength of 1000 N/mm^2. The permissable shear stress for the spring wire can be taken as 50% of the ultimate tensile strength (G = 81370 N/mm^2). Design the spring and calculate :
      (i) Wire diameter.
      (ii) Mean coil diameter.
      (iii) Number of active coils.
      (iv) Total number of coils.
      (v) Free length of the spring.
      (vi) Pitch of the coil.
   Assume a gap of 1mm between adjucent coils under maximum load condition. The spring has square and ground ends.

3. (a) Design a shaft to transmit power from an electric motor to lathe head stock through pulley by means of belt drive. The pulley weighs 200N and is located at 300mm from the centre of the bearing. The diameter of pulley is 200mm and maximum power transmitted is 1KW at 120 r.p.m .The angle of lap for belt is 180^0 and coefficient of friction between belt and pulley is 0.3. The shock and fatigue factor for bending and twisting are 1.5 and 2.0 respectively. The allowable shear stress in the shaft may be taken as 35 Mpa. **10**

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(b) A bracket for supporting the travelling crane is shown in Fig (1) the bracket is fixed to the steel column by means of four identical bolts, two at A and two at B. The maximum load that come on the bracket is 5 KN acting vertically downward at a distance of 250mm from the face of the column. The bolts are made of steel 40 C8 (S_{yt} = 380 N/mm^2) and the factor of safety is 5. Determine the major drameter of the bolts on the basis of maximum principle stress. Assume (dc = 0.8d) **10**

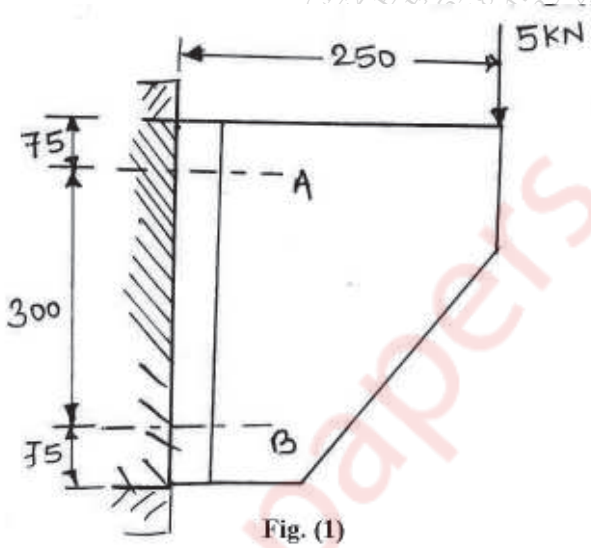

Fig. (1)

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

(b) A single-row deep groove ball bearing is subjected to a radial force of 8KN and a thrust force of 3KN. The shaft rotates at 1200 rpm. The expected life. L_{10h} of the bearing is 20,000h. The minimum acceptable diametre of the shaft is 75mm. Select a suitable ball bearing for this application. **07**

(c) The following data is given for a 360^0 hydro-dynamic bearing : **07**

Length to diameter ratio	=	1
journal speed	=	1350 rpm
journal diameter	=	100 mm
diameteral clearance	=	100 μ m
external load	=	9 KN

The value of minimium film thickness variable is given 0.3 Find the visiosity of oil that need to be used

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5. (a) The turning moment diagram of a multi-cylinder engine is drawn with a scale of (1 mm = 1^0) on the abscissa and (1mm = 250 N-m) on the ordinate. The intercepted areas between the torque developed by the engine and the mean resiting torque of the machine, taken in order from one end are -350 + 800 , -600 +900, -550, +450 and -650 mm^2. The engine is running at a mean speed of 750 rpm and the coefficient of speed fluctuations is limited to 0.02. A rimmed flywheel made of grey cast iron FG 200 (ρ = 7100 kg/m^3) is provide. The rim contributes 90% of the required moment of inerria. The rim has rectengular cross-section with width to thickness ratio 1.5 determine the dimmension of the rim. **10**

(b) A cantilever beam made of cold-drawn steel 40C8 (S_{ut} = 600 N/mm^2 and S_{yt} = 380N/mm^2) is shown in fig (2). The force P acting at the free end varies from -50N to +150N. The expected relability is 90% and factor of safety is 2. The notch sensitivity factor at the fillet is 0.9. Determine the diameter 'd' of the beam the fillet cross-section. **10**

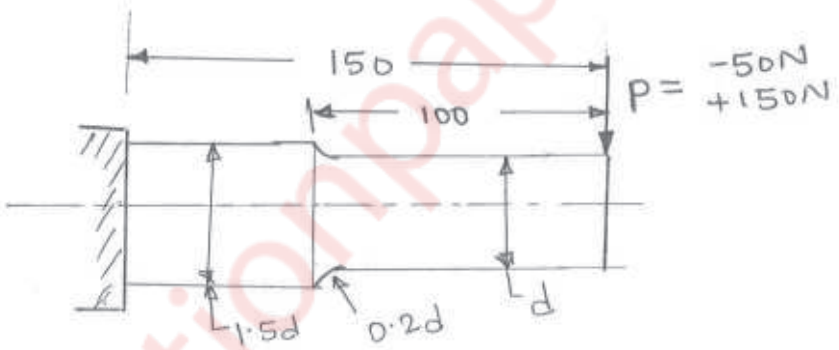

fig. (2)

6. (a) State and explain Maximum principle stress theory of failure. **06**

(b) Explain desing consideration in casting. **06**

6. (c) Designate the following engineering materials : **08**

(i) FG 200
(ii) 30 C8
(iii) 25 Cr4 Mo2
(iv) 16 Ni3 Cr2
