OR

A 75kW at 3000rpm is to be transmitted by a multiple plate clutch. The plates have friction surfaces of steel and phosphor bronze alternatively run in oil. Design the clutch for 30% overload and sketch the arrangement of plates.

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5 a) Write Reynold's equation for journal bearing. State its significance.

b) State brief about selection of ball and roller bearing.

c) Explain brief about boundary lubrication in journal bearing.

d) Derive Petroffs equation for the coefficient of friction in a lightly loaded bearing.

OR

Design the journal bearing for a centrifugal pump from the following data :
Load on the journal = 10 kN,
Speed on the journal = 900 rpm,
Ambient temperature = 150 C.

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Roll No ...

AU/ME - 504

B.E. V Semester

Examination, June 2016

Machine Component Design

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

v) Assume missing data suitably, if any. Design data book is permitted.

1 a) What is stress concentration? Draw stress concentration in tension, bending and torsion.

b) Define the following terms :
   i) Loading factor
   ii) Size factor
   iii) Surface factor

c) State Soderberg equation. State its significance and applications.

d) Explain:
   i) S-N curve
   ii) Cyclic loading
   iii) Goodman's diagram

OR

The working cycle of a mechanical component subjected to reverve bending is as follows:

i) ± 400 N/mm^2 for 75% of time

ii) ± 500 N/mm^2 for 15% of time

iii) ± 550 N/mm^2 for 10% of time

The material for the component is 50C4 (δ = 600 MPa) and corrected endurance strength of the component is 270 N/mm^2. Determine the life of the component.

2 a) State about the following keys:

i) Rectangular sunk key

ii) Square sunk key

iii) Parallel sunk key

iv) Gib head key

v) Feather key

vi) Woodruff key

b) Explain brief about types of shaft couplings.

c) How the strength of a steel material for shafting is estimated in ASME design code for shaft?

d) A hollow shaft of diameter ratio is required to transmit 600kW at 110rpm, the maximum torque being 20% greater than mean. The shearing stress is not to exceed 62 mN/m^2 and twist in length of three metres is not to exceed 1.4 degrees. Determine the diameter of the shaft. Assume modulus of rigidity for shaft material as 84 GN/m^2.

OR

A shaft is required to transmit a power of 25kW at 360rpm. The force analysis due to attached parts results in BM of 830 Nm at a section between bearings. If permissible stresses in the shaft are: 60N/mm^2 in bending and 40N/mm^2 in shear calculate the diameter of the shaft.

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3 a) Define following terms related to spring:

i) Spring rate ii) Spring index

b) Explain brief about surge in springs.

c) State the classifications of springs with their applications.

d) Design a closed coil helical spring for a service load ranging from 2250N to 2757N. The axial deflection for the load range is 6mm, assume the spring index = 5, permissible shear stress is 420MPa and modulus of rigidity is 840Gpa. Neglect the effect of stress concentration.

OR

A helical spring is to fit about a 11/16-in. Rod with a free length of 2 ¾ in. Or less. A maximum load of 8 lb. is to produce a deflection of 1 ¾ in. The spring is expected to be compressed less than 5000 times during its life, but is subjected to relatively high temperatures and corrosive atmosphere. Select a material and determine the necessary wire size, mean coil diameter, and number of coils.

4 a) Discuss internal expanding breaks.

b) Explain brief about cone and centrifugal clutch.

c) State the classifications of brakes with their applications.

d) An internal expanding brake has an inner surface of rim of diameter 500mm. The distance between the fulcrums is 100mm. The distance between the fulcrums and the point of application of efforts is 400mm. The brake linings sustain an angle of 1200 at the centre. The material of the lining has the coefficient of friction of 0.3 and an allowable bearing pressure of 0.5 MPa. Determine:

i) The effort required to stop the rotation of the brake drum.

ii) The width of the brake lining

The brake transmits a power of 30kW at a rated speed of 1500rpm.