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

b) State brief about factors affecting bearing life.

c) Explain brief about boundary lubrication in journal bearing.

d) Derive Petroff's equation for the co-efficient of friction in a lightly loaded bearing.

OR

Design the journal bearing for a centrifugal pump from the following data :

Load on the journal = 25 kN

Speed on the journal = 600 rpm

Ambient temperature = 25° C

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Roll No .....

AU/ME - 504

B.E. V Semester

Examination, December 2015

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.

1 a) State the causes of stress concentration in brief.

b) Define the terms :

i) Notch sensitivity

ii) Cyclic loading

c) Draw Goodman's diagram. State its significance.

d) Explain :

i) S-N curve

ii) Soderberg equation

OR

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A round, steel tension member, 1.5m long, is subjected to a maximum load of 4000kg.

i) What should be its diameter if the total elongation is not to exceed 3 mm?

ii) Choose a steel that would be suitable on the basis of yield strength if the load is gradually applied and repeated (not reversed).

2 a) Compare Rectangular sunk key, Square sunk key and parallel sunk key.

b) State the functions of shaft, axle and spindle.

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

d) A shaft carries a 900 N pulley in the centre of two ball bearings which are 1800 mm apart. The pulley is keyed to the shaft and receives 40 kW of power at 150 rpm. The power is transmitted from the shaft through a flexible coupling just outside the right bearing. The belt derive is horizontal and the sum of the belt tension is 8000N. Calculate the diameter of the shaft if permissible stress in bending is 90 N/mm^2 and in shear it is 45 N/mm^2.

OR

Explain the steps for designing a shaft under dynamic load considering suitable example.

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3 a) State about various types of springs.

b) Define Spring Buckling.

c) Explain brief about fatigue loading of springs.

d) Design a helical spring for a safety valve. The valve must below off at a pressure of 1.2 MPa and should lift by 3mm for 5% increase in pressure. The valve diameter is 55 mm. The max allowable shear stress is 400 MN/m^2 and the modulus of rigidity is 82.7×10^3 MN/m^2. Take the spring index as 9.

OR

Design a valve spring of a petrol engine for the following operating conditions :

Spring load when valve is open = 450 N

Spring load when valve is closed = 250 N

Max. Inside diameter of spring = 25 mm

Length of spring when valve is open = 40 mm

Length of spring when valve is closed = 50 mm

Max. strength = 400 MPa

4 a) State the classification of breaks.

b) State the classifications of clutches with their applications.

c) Discuss uniform pressure and uniform wear theories for breaks and clutches.

d) Discuss the design steps for disk brakes with formula used.

OR

Design a cone clutch to transmit a power of 50 kW at a rated speed of 700 rpm. Also determine :

i) The axial force capacity

ii) The axial force necessary to transmit the torque

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