5 a) What is a bearing. Differentiate between radial and thrust bearing.

b) What is Hydrodynamic bearing? Give its applications.

c) Explain the principle of hydrodynamic lubrication.

d) Discuss the design procedure of a journal bearing.

OR

Design the main dimensions of a journal bearing for the crank shaft of a four stroke petrol engine to carry a radial load of 10 kN. The journal diameter is 50mm and it rotates at 1000 rpm. SAE 30 oil is used.

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Roll No .....

AU/ME - 504

B.E. V Semester

Examination, June 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) What is stress concentration.

b) What is S-N curve? Explain its importance.

c) Explain the mechanism of fatigue failure.

d) A spherical pressure vessel with a 500 mm inner diameter is welded from steel plates of cold drawn C20 steel of ultimate strength 440 N/mm^2. The vessel is subjected to internal pressure which varies from 2 N/mm^2 to 6 N/mm^2. If the reliability of the vessel is 95 percent and the requested factor of safety is 3, design the vessel for an infinite life period.

OR

A shaft is subjected to a mean torque of 3×10^6 N-mm super imposed with a variable torque of 3×10^6 N-mm. It is also subjected to a bending moment whose mean is zero and alternating component is 6×10^6 N-mm Design the shaft for infinite number of cycles. Shaft material is ground SAE 1020 steel.

2 a) What are the requirements of shaft material discuss.

b) How is the strength of a shaft affected by the keyway. Explain.

c) Discuss the design of shaft under combined torque and bending moment.

d) A pulley is keyed to a shaft midway between two bearings. The shaft is made of cold drawn steel for which the ultimate strength is 600 N/mm^2 and the yield strength is 450 N/mm^2. The bending moment at pulley varies from –200 N-m to 400 N-m and the torque on the shaft varies from –100 N-m to 250 N-m. Design a suitable shaft for infinite life.

OR

Discuss the design of sunk key in detail.

3 a) Define spring constant.

b) Differentiate between compression and tension spring.

c) What is Helical torsional spring? Where are they used.

d) Calculate dimensions of a helical spring for a spring loaded safety value (Rams bottom type) from following data:

Dia of valve - 63.5 mm

Max pressure when the valve - 0.71 MPa blows off.

Valve lift when pressure increases 3.175 mm from 0.68 MPa to 0.71 MPa

Permissible stress m spring - 550 MPa

Spring index - 6

Modulus of rigidity of spring material - 81600 MPa

OR

Discuss the design of power screw.

4 a) What do you understand by positive clutch?

b) What are the materials used for lining of friction surface.

c) What is a brake. Discuss basic types of brake.

d) A plate clutch having a single driving plate with contact surfaces on each side is required to transmit 110 kW at 1250 rpm. The outer diameter of the contact surface is to be 300 mm. The coefficient of friction is 0.4. Assuming a uniform pressure of 0.17 N/mm^2. Determine the inner diameter of the friction surface.

OR

A band and block brake has a brake drum of 1.0 m dia and is fitted with 24 blocks, each having a contact angle of 10°. The radial thickness of each block from the centre line of the band to the rim of wheel is 70mm. The band is designed to sustain a maximum force of 2000 N. A lever of length 800 mm and 100 mm × 80 mm cross sectional area is used to apply the brake. Calculate the force required to be applied at the end of lever. If $\mu = 0.4$.