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Total number of printed pages – 2

B. Tech
CPME 6306 (Old)

Sixth Semester (Back) Examination – 2013

MACHINE DESIGN – II

BRANCH : MECH

QUESTION CODE : B360

Full Marks – 70

Time : 3 Hours

Answer Question No. 1 which is compulsory and any **five** from the rest.
The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10
- (a) Differentiate yielding and fracture.
- (b) What is endurance limit? How it related to allowable stress ?
- (c) What is the basic difference between clutch and brake ?
- (d) Under what conditions self- locking is desirable ?
- (e) What are the important factors in brake design ?
- (f) Define the term bearing characteristic number and bearing modulus.
- (g) Differentiate between pivot and collar bearing.
- (h) What is law of gearing ?
- (i) Name the possible modes of failure to be considered for the design of piston pin and crank pin.
- (j) What is the function of a fly-wheel ?
2. (a) State and explain the maximum stress theory of failure. 5
- (b) A thin walled cylindrical pressure vessel of 0.6 m diameter is subjected to an internal pressure, varying from 2 to 4 N/mm². Determine the thickness of the vessel, using $\sigma_y = 400$ Mpa, $\sigma_e = 200$ Mpa, and factor of safety is 2.5. Use Soderberg criterion for failure. 5
3. A centrifugal clutch is to be designed to transmit 15 Kw at 900 rpm. The shoes are four in number. The speed at which the engagement begins is 3/4th of the

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running speed. The inside radius of pulley rim is 150 mm. The shoes are lined with Ferrodo for which the coefficient of friction may be taken as 0.25. Determine the mass and the size of the shoes. 10

4. (a) Derive the expression for braking torque for a band and block brake. 5
(b) A single block brake has the drum diameter 250 mm, length of lever is 400 mm and height of pivot from drum axis is 100 mm. The block is placed at centre of the lever, the angle of contact is 90° and the coefficient of friction between drum and lining is 0.35. If the torque transmitted by the brake is 70 Nm, find the force P required to operate the brake. 5
5. (a) A journal bearing 100mm in diameter and 150 mm long carries a radial load of 7 kN at 1200 rpm. The diametral clearance is 0.075 mm. Find the velocity of the oil being used at the operating temperature, if 1.2 kw power is wasted in friction. 5
(b) What are the advantages and disadvantages of rolling contact bearing? Briefly discuss about different types of rolling contact bearing. 5
6. A cast steel spur pinion ($\sigma_d = 200$ Mpa) running at 450 rpm, transmits 20 Kw power to a cast iron gear ($\sigma_d = 80$ Mpa) running at approximately 112 rpm. The load is steady. Design the drive and check for dynamic and wear loads. 10
7. Design the piston of a 4-stroke I.C. engine with following specifications :
Cylinder bore = 100 mm
Stroke length = 120 mm
Maximum gas pressure = 4 N/mm^2
Indicated mean effective pressure = 0.75 N/mm^2
Mechanical efficiency = 80%
Fuel consumption = 0.15 kg per BHP hour
Higher calorific value of the fuel = 42×10^3 KJ/kg
Speed = 2000 rpm
Assume any other relevant data required. 10
8. Write short notes on any **two** : 5×2
(a) Fly wheel
(b) Foot step bearing
(c) Bevel gears
(d) Internal expanding shoe brake.

