



Register Number:.....

B.E. DEGREE EXAMINATIONS: MAY 2015

(Regulation 2009)

Fifth Semester

MECHANICAL ENGINEERING

MEC114 : Design Of Machine Elements

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. According to Indian standard specifications, a plain carbon steel designated by 40C8 means that
 - a) Carbon content is 0.04 per cent and manganese is 0.08 per cent
 - b) Carbon content is 0.4 per cent and manganese is 0.8 per cent
 - c) Carbon content is 0.35 to 0.45 per cent and manganese is 0.60 to 0.90 per cent.
 - d) Carbon content is 0.60 to 0.80 per cent and manganese is 0.8 to 1.2 per cent.
2. The stress in the bar when load is applied suddenly is as compared to the stress induced due to gradually applied load.
 - a) same
 - b) double
 - c) three times
 - d) four times
3. Two shafts will have equal strength, if
 - a) diameter of both the shafts is same
 - b) angle of twist of both the shafts is same
 - c) material of both the shafts is same
 - d) twisting moment of both the shafts is same
4. The sleeve or muff coupling is designed as a
 - a) thin cylinder
 - b) thick cylinder
 - c) solid shaft
 - d) hollow shaft
5. The property of a bearing material which has the ability to accommodate small particles of dust, grit etc., without scoring the material of the journal, is called
 - a) Bondability
 - b) Embeddability
 - c) Comformability
 - d) Fatigue strength
6. Which of the following is antifriction bearing?
 - a) Journal bearing
 - b) Pedestal bearing
 - c) Collar bearing
 - d) Needle bearing
7. The parallel fillet welded joint is designed for
 - a) Tensile strength
 - b) Compressive strength

friction between belt and pulley 0.3. shock factor in bending 1.5 shock factor in twisting 2.0 allowable shear stress in the shaft 35 N/mm^2 .

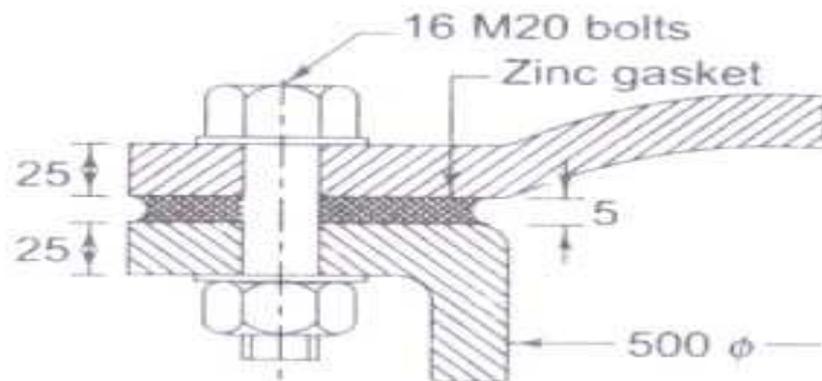
(OR)

- b) Power is to be transmitted from a motor shaft to another shaft through a gear driver. Motor rating is 3680 watt at 12 rps. Design the shaft receiving power if a speed ratio of 2 is employed shaft material is to be C50. Also find the angular deflection per meter length of the shaft. Take $G = 0.85 \times 10^5 \text{ N/mm}^2$.

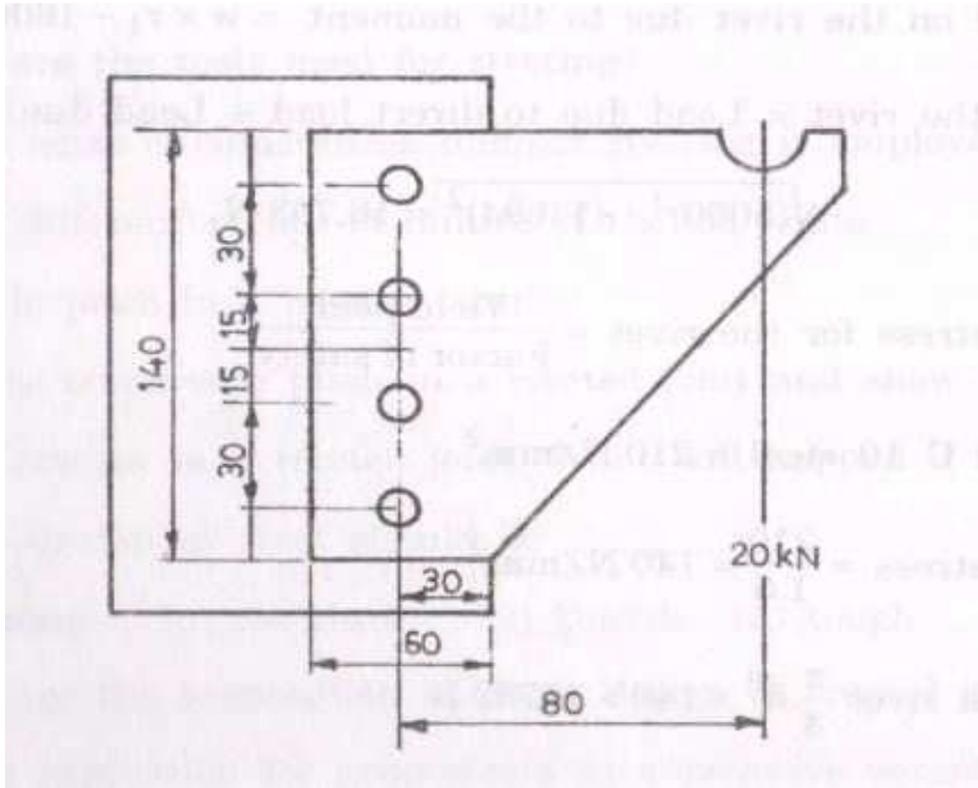
23. a) A bearing 50 mm in diameter and 75 mm in length supports an overhanging shaft, running at 900 rpm. The room temperature is 30°C and the bearing temperature is 75°C . The viscosity of the oil used is 0.012 kg/m-s at the operating temperature of 120°C . The diametral clearance is 0.05 mm and the bearing is to operate in still air, without any artificial cooling. Determine (i) the permission load on the bearing and (ii) power loss

(OR)

- b) The cover of cylindrical pressure vessel made of cast iron is shown in Fig.1 The inner diameter of the cylinder is 500 mm and the internal pressure is limited to 2 MPa. The cover is fixed to the cylinder by means of 16 bolts with a nominal diameter of 20 mm. Each bolt is initially tightened with a preload of 20kN. The bolts are made of steel FeE 250 ($S_{yt} = 250 \text{ N/mm}^2$). Assume E for steel = 207 kN/mm^2 , E for cast iron = 100 kN/mm^2 , E for zinc = 90 kN/mm^2 . Determine the factor of safety for bolts considering the effect of the gasket.



24. a) A bracket is supported by means of four rivets shown in fig 2. Determine the diameter of the rivet is to made of C 10 steel. A factor of safety of may be taken.



(OR)

- b) A Knuckle joint is to transmit a force of 140,000 N. Allowable stresses intension, shear and compression are 75 N/sq.mm, 65 N/sq.mm and 140 N/sq.mm respectively. Design the joint.

25. a) Design a helical spring for a spring loaded safety valve from the following data
 Valve diameter = 65 mm
 Maximum pressure when the valve blows off freely = 0.75 N/mm²
 Valve lift when pressure rises from 0.7 to 0.75 N/mm² = 3mm
 Maximum permissible stress in the material of the spring = 500 N/mm²
 Spring index = 6
 Modulus of rigidity of the spring material = 1×10^5 N/mm²

(OR)

- b) A machine working intermittently requires the torque to be applied as the follows: During the first half revolution, the torque increases uniformly from 1000 Nm to 3000 Nm. During the next one revolution, the torque remains constant. During the next half revolution, the torque decrease from 3000 Nm to 1000 Nm. During the last one revolution, the torque remains constant. The cycle is thus completed in 3 revolutions. The motor to which the machine is coupled, exert a constant torque at 250 rpm. Determine the power of the motor. If the total fluctuation of the speed is not exceeding 2% of the mean speed; determine the diameter of the flywheel and cross section of the flywheel rim. Assume that the entire mass of the flywheel is concentrated at the rim of the flywheel. The width of the rim may be taken as 3 times the thickness of the rim. the centrifugal stress in the rim is limited to 10 Mpa. The density of the flywheel material may be taken as 7200 kg/m³.
