Reg. No…….

Name…….

B.TECH DEGREE EXAMINATION, MAY 2014

Eighth Semester

Branch: Production Engineering

PE 010 803 - Machine design (PE)

MODEL QUESTION PAPER

(Regular-New Scheme-2010)

Time: Three Hours Maximum: 100 Marks

Part A

*Answer **all** questions.*

Each question carries 3 marks.

1. What do you mean by Endurance limit?
2. Distinguish between rigid coupling and flexible coupling.
3. What do you mean by module?
4. What are the advantages of welded joints over riveted joints?
5. Explain hoop stress and longitudinal stress.

(5x3 = 15 marks)

Part B

*Answer **all** questions.*

Each question carries 5 marks.

6. Explain different types of Fits.
7. Discuss different types of keys.
8. What are the different classifications of gears?
9. What are the differences between butt joint and fillet weld joints?
10. Explain lame's equation.

(5x5 = 25 marks)

Part C

*Answer **all** questions.*

Each question carries 12 marks.

11. Explain
    i. Maximum Shear stress theory.
    ii. St. Venant's theory
    iii. Distortion energy theory.

OR

12. Discuss different stages in design process.

13. A steel solid shaft transmitting 15kW at 200r.p.m is supported on two bearings 750mm apart and has two gears keyed to it. The pinion having 30 teeth of 5mm, module is located 100mm to the left of the right hand gearing and delivers power horizontally to the right. The gear having 100 teeth of 5mm module is located 150 mm to the right of the left hand bearing and receives power in a vertical direction from below. Using an allowable stress of 54 MPa in shear, determine the diameter of the shaft.

OR

14. Design a cast iron flange coupling for a mild steel shaft transmitting 90kW at 250 r.p.m. The allowable shear stress in the shaft is 40MPa and the angle of twist is not to exceed 1^{o} in a length of 20 times the diameter. The allowable shear stress in the coupling bolts is 30MPa.

15. A gear drive is required to transmit a maximum power of 22.5kW. the velocity ratio is 1:2 and r.p.m of the pinion is 200. The approximate centre distance between the shafts may be taken as 600mm. The teeth has 20^{o} stub involute profiles. The static stress for the gear material (Cast iron) may be taken as 60MPa and face width as 10 times the module. Find the module, face width and number of teeth on each gear.

Check the design for dynamic and wear loads. The deformation or dynamic factor in the Buckingham's equation maybe taken as 80 and the material combination factor for the wear as 1.4.

OR

16. A helical cast steel gear with 30^o helix angle has to transmit 35 kW at 1500 r.p.m. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20^o full depth teeth. The static stress for cast steel maybe taken as 56MPa . The width of face maybe taken as 3 times the normal pitch. What would be the end thrust on the gear? The tooth factor for 20^o full depth involute gear maybe taken as, $0.154 - (0.912/T_E)$, where T_E represents the equivalent number of teeth.

17. Find the efficiency of the following riveted joints.

    i. Single riveted lap joint of 6mm plates with 20mm diameter rivets having a pitch of 50mm.
    ii. Double riveted lap joint of 6mm plates with 20mm diameter rivets having a pitch of 65mm.

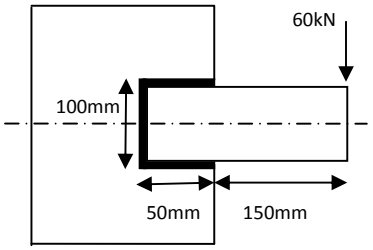
    Assume: Permissible tensile stress in plate = 120MPa

    Permissible shearing stress in rivets = 90MPa

    Permissible crushing stress in rivets = 180MPa

OR

18. A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load of 60kN as shown in figure. Determine the weld size if the shear stress in the same is not to exceed 140MPa.



19. A cast iron cylinder of internal diameter 200mm and thickness 50mm is subjected to a pressure of 5N/mm^2. Calculate tangential and radial stresses at the inner, middle (radius = 125mm) and outer surfaces.

OR

20. (a) A thin cylinder pressure vessel of 500mm diameter is subjected to an internal pressure of 2N/mm^2. If the thickness of the vessel is 20mm, find the hoop stress, longitudinal stress and maximum shear stress.

(b) A hydraulic press has a maximum capacity of 1000kN. The piston diameter is 250mm. Calculate the wall thickness, if the cylinder is made of material for which the permissible strength may be taken as 80MPa. This material maybe assumed as brittle material.
