UNIT -II (DESIGN OF SHAFTS, KEYS AND COUPLINGS)
PART-A
1. What is a shaft?
2. Write down the formula for finding equivalent twisting moment.
3· Define the term critical speed.
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4. What is a key?
5. What are the types of keys?
6. Differentiate between keys and splines.
7. What is the function of a coupling between two shafts?
8. What are flexible couplings used?
9. What is the material used for flange or flange coupling?
10. Differentiate between a cotter joint and a knuckle joint

UNIT -II (DESIGN OF SHAFTS, KEYS AND COUPLINGS)
PART-B
1. A line shaft rotating at 200rpm is to transmit 20KW power. the allowable shear stress for the shaft
material is 42N/mm2.If the shaft carries a central load of 900N and is simply supported between
bearing 3meters apart determine the diameter of the shaft. The maximum tensile or compressive stress
is not to exceed 56N/mm^2• (16)
2. An electric generator rotates at 200rpm and receives 300KW from the driving engine. The armature
of the generator is 60cm long and located between bearing 120cm center to center. Owing to the
combined weight of armature and magnetic pull, the shaft is subjected to 9000kg acting at right angles
to the shaft. The ultimate stress for the shaft is 4480kg/cm2 and shear stress is 3920kg/cm2.Find the
diameter of the shaft for a factor of safety of 6. (16)
3. A mild steel shaft transmit 23KW to 200rpm.It carries a central load of 900N and is simply supported
between the bearing 2.5meters apart. Determine the size of the shaft, if the allowable shear stress is
42MPa and the maximum tensile or compressive stress is not exceed 56MPa. What size of the shaft will
be required, if it is subjected to gradually applied load? (16)
4. A shaft to transmit 50KW at 1200rpm.It is also subjected to a bending moment of 275NNm.Allowable shear stress is 60N/mm^2.The shaft is not to twist more than 20 in a length of
2m.G=80XI03N/mm^2.Design a shaft. (16)
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5. A factory line shaft is 4.5m long and is to transmit 75KW at 200rpm.The allowable stress in shear is

45MPa and maximum allowable twist is 10 in a length of 20mm diameter. Determine the required shaft
diameter. (16)
6. Design and draw a cast iron flange coupling for a mild steel shaft transmitting 90KW at 250rpm. The
allowable shear stress in the shaft is 40MPa and the angle of twist is not to exceed 10mm in a length of
20mm diameters. The allowable shear stress in the coupling bolt is 30MPa. (16)
7. Design a cast iron protective type flange coupling to transmit 15KW at 900rpm from an electric
motor to a compressor. The service factor may be assumed as 1.35.
The following permissible stress may be used:
Shear stress for the shaft, bolt and key material=40MPa Crushing stress for bolt and key=80Mpa
Shear stress for cast iron=8Mpa (16)
8. A rigid type coupling is used to connect two shaft transmit 15KW at 200rpm.The shaft, key and bolts
are made ofC45 steel and the coupling is of C.I. Design the coupling. (16)
9. Design and sketch protective type C.I flange coupling to transmit 10KW at 250rpm. The permissible
shear stress for key, shaft, and bolt as 50N/mm2.Take crushing stress of key as 90N/mm^2 and shear
stress for C.I as 14N/mm2.Assume maximum torque is 30% higher than mean torque. (16)
10. A knuckle joint is to transmit a force of 140KN.Allowable stresses in tension, shear and
compression are 75N/mm^2, 65N/mm^2 and 140N/mm^2 repectively.Design the joint. (16)