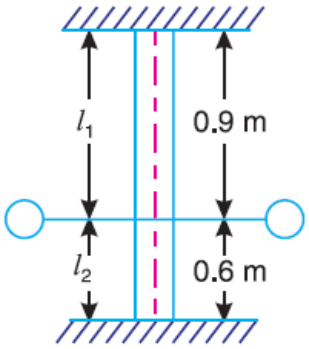
UNIT–V

S.No.		Questions	BT	CO	PO
Part – A (Short Answer Questions)					
1		Define resonance	L1	CO5	PO1,PO2
2		Classify vibrations and define them	L2	CO5	PO1,PO2
3		What is the limit beyond which damping is detrimental and why?	L3	CO5	PO1,PO2
4		What is meant by critical damping?	L2	CO5	PO1,PO2
5		Explain the Dunkerly's method used in natural transverse vibration?	L2	CO5	PO1,PO2
6		Define critical or whirling or whipping speed of a shaft	L2	CO5	PO1,PO2
7		Critical speed of shaft is the same as the natural frequency of transverse vibration. Justify?	L4	CO5	PO1,PO2
8		Define torsional equivalent shaft?	L2	CO5	PO1,PO2
9		When do you say a vibration system in under-damped?	L2	CO5	PO1,PO2
10		State the factors that affect the critical speed of a shaft?	L2	CO5	PO1,PO2
Part – B (Long Answer Questions)					
11	a)	A shaft of length 0.75 m, supported freely at the ends, is carrying a body of mass 90 kg at 0.25 m from one end. Find the natural frequency of transverse vibration. Assume E = 200 GN/m^2 and shaft diameter = 50 mm.	L3	CO5	PO1,PO2
	b)	A cantilever shaft 50 mm diameter and 300 mm long has a disc of mass 100 kg at its free end. The Young's modulus for the shaft material is 200 GN/m^2. Determine the frequency of longitudinal vibrations of the shaft.	L3	CO5	PO1,PO2
12	a)	Deduce the equation for natural frequency of free transverse vibrations for a shaft subjected to a number of point loads using Rayleigh's method	L3	CO5	PO1,PO2
	b)	A shaft 50 mm diameter and 3 metres long is simply supported at the ends and carries three loads of 1000 N, 1500 N and 750 N at 1 m, 2 m and 2.5 m from the left support. The Young's modulus for shaft material is 200 GN/m^2. Determine the frequency of transverse vibration	L3	CO5	PO1,PO2
13		A shaft 1.5 m long, supported in flexible bearings at the ends carries two wheels each of 50 kg mass. One wheel is situated at the centre of the shaft and the other at a distance of 375 mm from the centre towards left. The shaft is hollow of external diameter 75 mm and internal diameter 40 mm. The density of the shaft material is 7700 kg/m^3 and its modulus of elasticity is 200 GN/m^2. Calculate the lowest whirling speed of the shaft, taking into account the mass of the shaft.	L3	CO5	PO1,PO2

14		A vertical shaft of 5 mm diameter is 200 mm long and is supported in long bearings at its ends. A disc of mass 50 kg is attached to the centre of the shaft. Neglecting any increase in stiffness due to the attachment of the disc to the shaft, find the critical speed of rotation and the maximum bending stress when the shaft is rotating at 75% of the critical speed. The centre of the disc is 0.25 mm from the geometric axis of the shaft. E = 200 GN/m^2.	L3	CO5	PO1,PO2
15	a)	A flywheel is mounted on a vertical shaft as shown in Fig. The both ends of a shaft are fixed and its diameter is 50 mm. The flywheel has a mass of 500 kg and its radius of gyration is 0.5 m. Find the natural frequency of torsional vibrations, if the modulus of rigidity for the shaft material is 80 GN/m^2. 	L3	CO5	PO1,PO2
	b)	A shaft of 100 mm diameter and 1 metre long has one of its end fixed and the other end carries a disc of mass 500 kg at a radius of gyration of 450 mm. The modulus of rigidity for the shaft material is 80 GN/m^2. Determine the frequency of torsional vibrations.	L3	CO5	PO1,PO2
16		A steel shaft ABCD 105m long has flywheel at its ends A&B. the mass of flywheel A is 600kg with radius of gyration 0.6m. The mass of flywheel D is 800kg with radius of gyration 0.9m. The connecting shaft has the diameter 50mm for the portion AB which is 0.4m long and diameter of 60mm for portion BC which is 0.5m long and diameter of d mm for portion CD which is 0.6m long. Determine: (i) the diameter'd' of portion CD to that node of torsional vibration of system will be at centre of length BC. (ii) Natural frequency of torsional vibration. The modulus of rigidity for the shaft material is 80 GN/m^2.	L4	CO5	PO1,PO2