TE Mechanical Sem VI (R2019) C Scheme 18/5/2022

University of Mumbai

Examinations Summer 2022

Machine Design

Time: 2 hour 30 minutes Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	For the given material, if the stress concentration factor is 2 and notch sensitivity is 0.1, the fatigue stress concentration factor is:
Option A:	1
Option B:	1.2
Option C:	1.1
Option D:	0.9
2.	For Overhauling condition of screw (If ϕ= Friction angle, α = Helix angle)
Option A:	$\phi < \alpha$
Option B:	$\phi > \alpha$
Option C:	$\phi = \alpha$
Option D:	$\phi = 4\alpha$
3.	Yield point in fatigue loading as compared to static loading is
Option A:	Same
Option B:	Higher
Option C:	Lower
Option D:	Depends on other factors
4.	Factor of safety is the ratio of ------
Option A:	working stress and ultimate strength
Option B:	yield strength and endurance strength
Option C:	ultimate strength and yield strength
Option D:	yield strength and working stress
5.	A closely coiled helical spring having 10 complete turns is subjected to a tensile force of 0.2 kN, mean diameter of the coil is 12 cm and diameter of the wire is 10 mm. Determine deflection in the spring. Take G = 80 kN/mm^2
Option A:	34.56 mm
Option B:	52.32 mm
Option C:	25.65 mm
Option D:	46.12 mm
6.	Fatigue failure results due to fluctuating stresses when the stress magnitude is ----
Option A:	more than ultimate tensile strength
Option B:	more than yield strength but lower than ultimate tensile strength
Option C:	lower than yield strength
Option D:	none of the above
7.	Polygon effected is related to which of the following drive?
Option A:	Belt drive

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Option B:	Rope drive
Option C:	Chain drive
Option D:	Gear drive
8.	In thick cylinders, the tangential stress across the thickness of cylinder --------
Option A:	remains uniform throughout
Option B:	varies from internal pressure at the inner surface to zero at the outer surface
Option C:	varies from maximum value at the inner surface to minimum value at the outer surface
Option D:	varies from maximum value at the outer surface to minimum value at the inner surface
9.	Guest's theory of failure is applicable for following type of materials
Option A:	Brittle
Option B:	Ductile
Option C:	Elastic
Option D:	Plastic
10.	In which of the following machine flywheel is used?
Option A:	Drilling machine
Option B:	Surface grinder
Option C:	Milling machine
Option D:	Punch press

Q2.	**Solve any Two Questions out of Three 10 marks each**
A	Design cotter joint for 80kN, which varies from tension to compression. Select suitable material, factor of safety and draw neat sketch.
B	The shaft is supported in bearing 1m apart and transmits 10 KW at 1440 rpm. through a pulley 'A' of 300 mm diameter, mounted at 250 mm to the right of left hand bearing and another pulley B of 400 mm diameter which is mounted at 350 mm to the left of right hand bearing. The angle of lap is 180^0 and coefficient of friction between the belt & both the pulleys is 0.3. The pulley 'A' weighs 250 N and weight of pulley 'B' is 500 N. Select suitable material and design shaft. Take belt tensions at pulley 'A' as vertically downward and that on pulley 'B' as horizontal.
C	A Deep groove ball bearing of a machine shaft is subjected to an axial load of 5 KN and radial load of 12KN when operating on 1000 rpm. Consider the expected life of 10,000 hours with survival probability of 92%. Select suitable standard bearing.

Q3.	**Solve any Two Questions out of Three 10 marks each**
A	75 kW power is transmitted by multi-plate clutch at 3000 rpm. The plates run in oil and coefficient of friction is 0.07. Axial intensity of pressure is not to exceed 0.15 N/mm^2. Due to space limitation external radius is restricted to 125 mm. Assuming number of springs as 6. i. Design Input and Output Shaft. ii. Design Friction and pressure plates.
B	Design a flat belt to transmit 15KW power from an electric motor rotating at 1440rpm to a centrifugal pump. The reduction ratio is 1.8. The belt thickness is assumed to be 5mm and expected life to be 1800 hours, find the belt width. If pulley overhang is assumed to be equal to width of belt, find shaft diameter. Take service factor as 1.2.
C	The load on a 75×75 mm 360^0hydrodynamic bearing is 12.5KN. Journal speed is 2000rpm and viscosity of oil is 10 Centipoise. Clearance ratio is $\frac{1}{1000}$. Calculate 1) Minimum oil film thickness 2) The coefficient of friction 3) Power loss in friction 4) The total flow rate

	5) Rise in temperature of bearing.	
4.	**Solve any Two 5 marks each**	
A	State the various types of keys used with shaft for torque transmission and describe their special features.	
i.	Explain aesthetic consideration in design with suitable examples.	
ii.	What is the necessity of theories of failure? List different theories of failure.	
B	**Solve any One**	**10 marks each**
i.	A 70 mm diameter solid rod is to be welded to a flat plate by a fillet weld all around the circumference of the rod. Determine the size of weld required if a load of 12 KN is applied at the end of 250 mm overhang. The permissible shear stress for the material of the weld may be assumed as 95 N/mm^2.	
ii.	A protected type flange coupling is required to transmit 20 kW at 300 rpm. Select suitable material for various parts and Design the coupling.	

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