University of Mumbai

Examination May-June 2021 under cluster 9 (FAMT)

Examinations Commencing from 1st June

Program: Mechanical Engineering

Curriculum Scheme: Rev2016

Examination: TE Semester VI

Course Code MEC602 and Course Name: Machine Design-I

Time: 2 hour Max. Marks: 80

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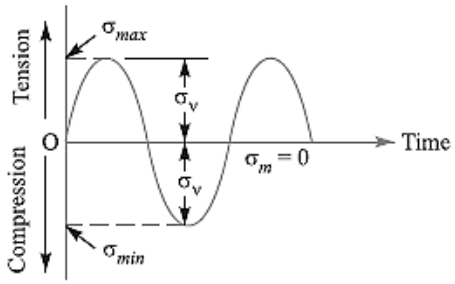
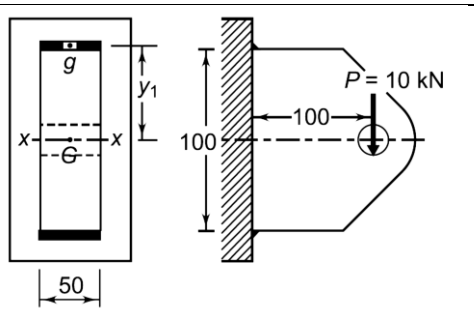
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The ratio of the ultimate stress to the design stress is known as
Option A:	elastic limit
Option B:	strain
Option C:	factor of safety
Option D:	bulk modulus
2.	In cyclic loading, stress concentration is more serious in
Option A:	brittle materials
Option B:	ductile materials
Option C:	brittle as well as ductile materials
Option D:	elastic materials
3.	In a thick cylindrical shell, the maximum radial stress at the outer surfaces of the shell is
Option A:	zero
Option B:	p
Option C:	$-p$
Option D:	$2p$
4.	Which of the following statement is incorrect in case of factors to be considered while designing machine parts to avoid Fatigue Failure?
Option A:	The variation in the size of the component should be as gradual as possible.
Option B:	The holes, notches and other stress raisers should be avoided.
Option C:	A smooth finish of outer surface of the component increases the fatigue life.
Option D:	The material with high fatigue strength shouldbe avoided.
5.	Which of the following is a permanent fastening
Option A:	Bolts
Option B:	Rivets
Option C:	Keys
Option D:	Cotter
6.	Failure of a material is called fatigue when it fails
Option A:	at the elastic limit
Option B:	below the elastic limit
Option C:	at the yield point
Option D:	below the yield point

7.	The maximum bending stress, in a curved beam having symmetrical section, always occur, at the
Option A:	centroidal axis
Option B:	neutral axis
Option C:	outside fibre
Option D:	inside fibre
8.	Select an appropriate option for a diagram 
Option A:	Completely reversed stress
Option B:	Repeated Stress
Option C:	Fluctuating Stress
Option D:	Non Repeated stress
9.	Which of the following type is not a type of End Connections for Compression Helical Springs?
Option A:	Plain ends
Option B:	Ground ends
Option C:	Squared ends
Option D:	Triangular ends
10.	The castings produced by forcing molten metal under pressure into a permanent metal mould is known as
Option A:	permanent mould casting
Option B:	slush casting
Option C:	die casting
Option D:	centrifugal casting
11.	According to IS : 1076 (Part I)–1985 (Reaffirmed 1990), which is not a preferred number of the basic series of R5
Option A:	1.50
Option B:	1.60
Option C:	2.50
Option D:	4.00
12.	Hooke’s law holds good upto
Option A:	yield point
Option B:	elastic limit
Option C:	plastic limit
Option D:	breaking point

13.	Which of the following assumptions is not true in case of curved beams
Option A:	The material of the beam is perfectly homogeneous and isotropic
Option B:	The material of the beam obeys Hooke's law.
Option C:	The Young's modulus (E) is not the same in tension and compression
Option D:	Each layer of the beam is free to expand or contract, independently, of the layer, above or below it.
14.	The parts of circular cross-section which are symmetrical about the axis of rotation are made by
Option A:	hot forging
Option B:	hot spinning
Option C:	hot extrusion
Option D:	hot drawing
15.	Two close coiled helical springs with stiffness $k1$ and $k2$ respectively are connected in series. The stiffness of an equivalent spring is given by (a) $\frac{k_1 \cdot k_2}{k_1 + k_2}$ (b) $\frac{k_1 - k_2}{k_1 + k_2}$ (c) $\frac{k_1 + k_2}{k_1 \cdot k_2}$ (d) $\frac{k_1 - k_2}{k_1 \cdot k_2}$
Option A:	(c)
Option B:	(d)
Option C:	(a)
Option D:	(b)
16.	The residential compressive stress by way of surface treatment of a machine member subjected to fatigue loading
Option A:	improves the fatigue life
Option B:	does not affect the fatigue life
Option C:	deteriorates the fatigue life
Option D:	immediately fractures the specimen
17.	In determining the strength of the knuckle joint for the various methods of failure, which of the assumptions is correct
Option A:	The stress is concentrated at pin
Option B:	The load is uniformly distributed over each part of the joint.
Option C:	The stress is concentrated at ends
Option D:	The load applied is different for every part
18.	In leaf springs, the longest leaf is known as
Option A:	Lower leaf
Option B:	Master leaf
Option C:	Upper leaf
Option D:	Middle leaf
19.	In a close coiled helical spring, the spring index is given by D/d where D and d

	are the mean coil diameter and wire diameter respectively. For considering the effect of curvature, the Wahl's stress factor K is given by (a) $\frac{4C-1}{4C+4}+\frac{0.615}{C}$ (b) $\frac{4C-1}{4C-4}+\frac{0.615}{C}$ (c) $\frac{4C+1}{4C-4}-\frac{0.615}{C}$ (d) $\frac{4C+1}{4C+4}-\frac{0.615}{C}$
Option A:	(c)
Option B:	(d)
Option C:	(a)
Option D:	(b)
20.	Torsional strength of shaft is written as (a) $\frac{\pi}{32}d^4\tau$ (b) $d\log_e\tau$ (c) $\frac{\pi}{16}d^3\tau$ (d) $\frac{\pi}{32}d^3\tau$
Option A:	(c)
Option B:	(d)
Option C:	(a)
Option D:	(b)

Q2.	**Solve any Two Questions out of Three (10 marks each)**
A	Design a Knuckle joint subjected to an axial pull of 10KN. Selecting suitable material for all the parts decide the allowable stresses. Design should include figures for the Joint and failure areas?
B	A shaft is supported by two bearings placed 1 m apart. A 550 mm diameter pulley is mounted at a distance of 350 mm to the right of left hand bearing and this drives a pulley directly below it with the help of belt having maximum tension of 2.25 kN. Another pulley 350 mm diameter is placed 210 mm to the left of right hand bearing and is driven with the help of electric motor and belt, which is placed horizontally to the right. The angle of contact for both the pulleys is 180° and μ = 0.24. Determine the suitable diameter for a solid shaft, allowing working stress of 63 MPa in tension and 42 MPa in shear for the material of shaft. Assume that the torque on one pulley is equal to that on the other pulley.
C	Draw a crane hook and check for critical sections for a load of 12 tonnes.

Q3.	Solve any Two Questions out of Three	10 marks each
A	A bracket is welded to the vertical column by means of two fillet welds as shown in the figure. Determine the size of the welds, if the permissible shear stress in the weld is limited to 70 N/mm^2.	
B	Design a bushed-pin type of flexible coupling to connect a pump shaft to a motor shaft transmitting 22 kW at 960 r.p.m. The overall torque is 10 percent more than mean torque. The material properties are as follows : (a) The allowable shear and crushing stress for shaft and key material is 40 MPa and 80 MPa respectively. (b) The allowable shear stress for cast iron is 15 MPa. (c) The allowable bearing pressure for rubber bush is 0.8 N/mm2. (d) The material of the pin is same as that of shaft and key. Draw neat sketch of the coupling.	
C	Design and draw a valve spring of a petrol engine for the following operating conditions : Spring load when the valve is open = 400 N, Spring load when the valve is closed = 250 N Maximum inside diameter of spring = 25 mm, Length of the spring when the valve is open= 40 mm, Length of the spring when the valve is closed= 50 mm, Maximum permissible shear stress = 400 MPa	

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