May-15

TE (Sem VII) Mech (MDD) (old)

Subj:- MD-I Date:- 18/5/15

Mech

(OLD COURSE) **QP Code : 4242**

(4 Hours) **[Total Marks : 100**

N. B. 1) Question No. 1 is compulsory.

2) Answer any Four questions from remaining six questions.

3) Assume suitable data wherever required but justify the same.

4) Answer to the questions showed be grouped and written together

Saraswati Education Society Library Kharghar

Qu. 1 Attempt any five from the following (20)

a) What do you understand by stress concentration? Elaborate with various cases.

b) Explain the mechanism of fatigue failure.

c) Explain the chordal action in case of chain drive.

d) Theories of elastic failures.

e) Explain effect of keyway on shaft strength give equation for shaft strength factor.

Qu.2 a) Design cotter joint to transmit load of 50 KN which varies from tension to compression, select suitable material factor of safety, Draw sketches of areas involved in various failures. (14)

b) Define FOS suggest various values for different types of load and materials and Explain on which factors FOS selection depends? (06)

Qu. 3 a) Design flange coupling (Protected type) to transmit 80 KW at 12000rpm. Select suitable material and FOS with justification. (12)

b) Find the diameter of the bolt of the arrangement shown in fig.1 Assume material of bolt $s_y = 350$ MPa and FOS = 3.5 (08)

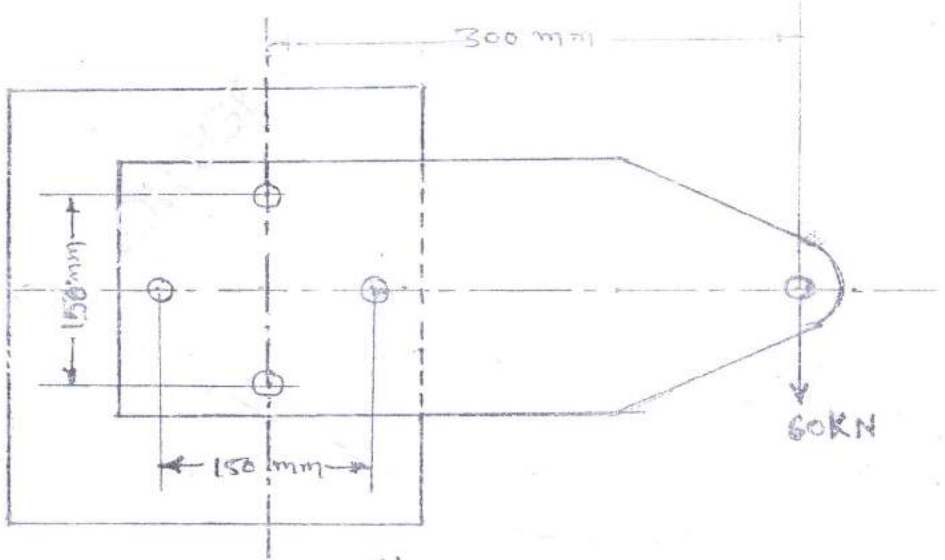


Fig. 1

Saraswati Education Society
Library
Kharghar

Qu.4 The input shaft of a machine is supported in bearings at A & D it receives 40 KW powerthrough a flat belt pulley, 400mm diameter located at B from a pulley located vertically below. The angle of lap is 225^0 and the coefficient of friction between belt and pulley is 0.25. The shaft rotates at 400rpm in anticlockwise direction when viewed from D and delivers power through a pinion having 20 teeth and 6 mm module having pressure angle of 20^0 located at C it transmits power to egear located horizontally in front.

The material for the shaft is 15-C-48 and FOS is 4 determine the shaft diameter. (20)

Qu.5 a) A helical compression spring is subjected to a force of 500 N with corresponding deflection of 20 mm. The spring index is 6. The spring material has UTS of $1000N/mm^2$. The permissible shaer stress for spring wire is 50% of UTS Modulus of rigidity is $8 \times 10^4 N/mm^2$. Design the spring and determine (16)

1) Wire diameter
2) Mean coil diameter
3) Number of active turns
4) Free length.

b) What do you understand by nipping with reference to leaf spring? (04)

Qu. 6 a) Explain different types of threads with their advantages and disadvantages. (04)

b)Screw press is subjected to load of 120KN, Hight of screw is 800 m, frame overhang is 400 mm, Design (16)

i) Screw and Nut
ii) The horizontal section of frame.

Qu. 7 a) V- belt drive has to transmit 20 KW at 1440 rpm with velocity ratio 2.2. decide optimum center distance. Find number of belt required as per belt material is 2.4MPa. (08)

b) Design flat belt drive to transmit 40 KW at 1000 rpm for center distance of 3m and velocity ratio 2. Permissible tensile stress for belt material is 2.4 MPa. (12)

Automotive System OBCS 19/11/15
Automobile Engg. TE (Sem VI)
TE sem-VI
Sub:- AS
AUTO

QP Code : 6275

(3 Hours) Total Marks : 80.

NB.
Note:
1. Question No. 01 is compulsory.
2. Attempt any three questions from remaining five questions.
3. Draw neat and labeled diagram wherever necessary.

Saraswati Education Society Library Kharghar

Q.01) Attempt any five questions out of six.

a) Explain whirling of shaft. [04]
b) Write short note on functional requirements of clutch. [04]
c) Write short note on automatic transmission. [04]
d) Write short note on worm & wheel type steering gear. [04]
e) Write short note on drum brake. [04]
f) Explain types of wheel. [04]

Q.02) a) Explain types of clutch. Also explain working of any one type of clutch. [08]
b) What is the drawback of sliding mesh gear box? Explain working of synchromesh gear box. [08]
c) Compare dependent & independent suspension. [04]

Q.03) a) Explain any one type of gear shifting mechanism used in automobile. [08]
b) Explain following terms: [08]
1. Toe in, 2.Camber, 3. King Pin Inclination, 4. Combined angle
c) Write short note on McPherson strut suspension. [04]

Q.04) a) Explain tyre construction in detail. [08]
b) Explain need of differential & its basic principle of working. [08]
c) Write short note on electric power steering [04]

Q.05) a) Explain the need of slip joint & universal joint in Hotchkiss drive. [08]
b) Explain different types of brake systems used in automobile. [08]
c) Write short note on centrifugal clutch. [04]

Q.06) a) What is the limitation of mechanical brake system? Also explain need & procedure for brake bleeding. [08]
b) What are drawbacks of single plate clutch? Explain working & application of multiplate clutch. [08]
c) Wtite short note on transfer case. [04]

MUPD15445 SARASWATI COLLEGE OF ENGINEERING KHARGHAR 19/11/2015 13:45:49

T.E (Sem VI) Mech & ~~Auto~~ MD-I
Mdy-15
Date: 18-5-15

QP Code : 4993

Mech Sub: - MD - I

Saraswati Education Society
Library
Kharghar

Max. Marks : 80
Duration : 3 hours

Instructions: 1) Question ***No. 1*** is compulsory
2) Answer any ***three*** from the remaining five questions
3) Use of recommended ***Design data book*** is permitted.
4) Use your judgment for unspecified data, if any .

Q. No 1. Solve any **four** of the followings:

a) What do you understand by following designations of materials
i) FG350 ii) 40C8 iii) FeE400 iv)30Ni4Cr1 v) 40Cr1Mo28
b) Explain the modes of failures in the mechanical components.
c) Why factor of safety is necessary in the design of mechanical components ?. Discuss the important factors influencing the selection of factor of safety.
d) 'Curved beams cannot be designed by applying the simple bending theory of straight beams' . Justify the statement.
e) What is surging of springs ?. What remedial measures you will suggest to avoid the surging ?.

Q.No.2 a) Design a spigot-socket type cotter joint to transmit an axial load of 42 kN. Select appropriate materials for its components and draw its neat sketch showing major dimensions on it. (14)

b) State the following theories of failure and state the relation between yield strength in shear and the yield strength for each of the theory. (2x3=6)
i) Maximum shear stress theory ii) Octahedral shear stress theory

Q.No. 3 a) State the assumptions made in the analysis of curved beams. (4)
b) Design a single start square threaded screw for a C-clamp shown in figure 1. The maximum force exerted by the clamp is 5 kN. Use the following data: (16)
i) yield strength of the screw material =390 N/mm^2
ii) shear strength of the nut and body material= 230 N/mm^2
iii) coefficient of the screw friction =0.14
iv) coefficient of the collar friction = 0.16

Saraswati Education Society Library Kharghar

v) mean collar radius = 8 mm
vi) factor of safety = 3
vii) permissible bearing pressure = 12 N/mm^2
viii) distance between axis of the handle and nut surface, l = 150 mm

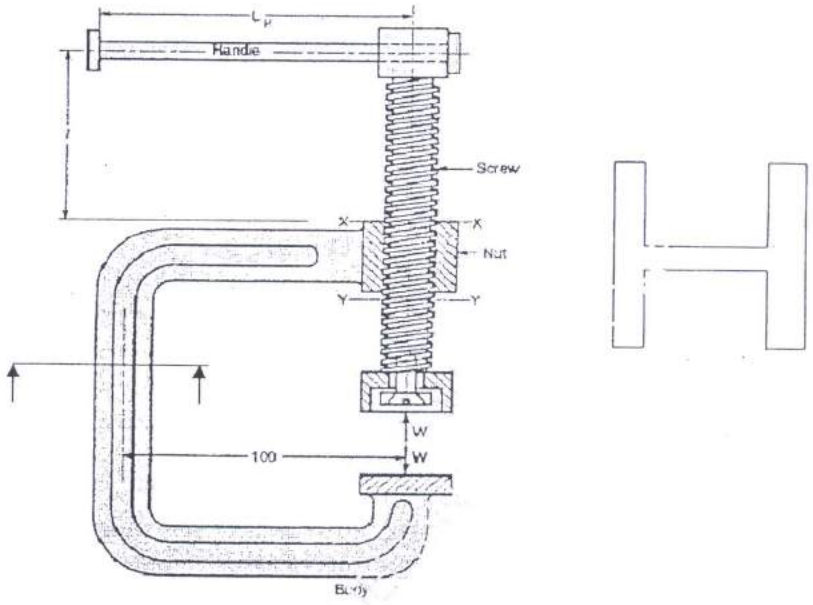


Figure 1 C-clamp

Also, design the I-section as shown by the side of figure 1, taking web = flange =4t, where t- thickness of flange and web of the I-section of the clamp body.

Q.No. 4 a) Explain Soderberg diagram and derive equation for a factor of safety based on this concept. (10)

b) The most critical point of component made of steel C40 is subjected to the following variable stresses. Determine the factor of safety based on Soderberg criterion and Octahedral shear theory. (10)

σ_x – varies from +12 to -10 N/mm^2
σ_y – varies from +14 ot +6 N/mm^2 and
τ_{xy} – varies from +10 to -10 N/mm^2

Saraswati Education Society Library Kharghar

Q.No. 5 a) A shaft is supported by two bearings placed 1.5 m apart. A 450 mm diameter flat belt pulley is mounted at a distance of 350 mm to the right of LH bearings and drives a pulley directly below it with the help of flat belt having tension on the tight side of 2.8 kN. Another V-groove pulley 300 mm p.c.d. is placed 300 mm to the left of RH bearing and is driven with the help of electric motor and V- belt. The motor is placed horizontally in front. The angle of contact of both the pulley is 180^0 and $\mu = 0.25$. the angle of V-groove is 35° . Select suitable material for the shaft and determine the diameter of the shaft.

What will be the diameter of the shaft, if it is a hollow shaft with ratio $\frac{d_i}{d_o} = 0.5$?.

Which one will you prefer ?. Comment on it. (16)

b) Explain the working of split-muff coupling with neat sketch. (4)

Q.No. 6 a) A helical coil compression spring is to be subjected to a maximum force of 4600 N with a corresponding deflection of 58 mm. The spring is to operate over a 40 mm diameter rod. Determine the wire diameter and number of active turns. Also, decide other details such as free length, pitch, helix angle etc. Check for the solid stress for the material of the spring as follows: (14)

$$S_u = \frac{2000}{d^{0.17}}\ N/mm^2\ ,\ S_{ys} = \frac{1200}{d^{0.17}}\ N/mm^2 \text{ and } G = 79300\ \frac{N}{mm^2}\ .$$

b) Explain any three different types of Keys. (3)

c) What is spring index of a helical spring ?. Discuss the significance of it in the design of it. (3)

TE (Sem VI) old/OTR MV May-15
Mech & Auto

Saraswati Education Society Library Kharghar

Mech Sub:- MV Date.. 22-5-15

(OLD COURSE)

QP Code : 4245

(3 Hours) **[Total Marks : 100**

N.B. : (1) Question No.1 is compulsory.
(2) Attempt any four questions from remaining six questions.
(3) Assume suitable data wherever required with justification.
(4) Figure to the right indicate full marks.

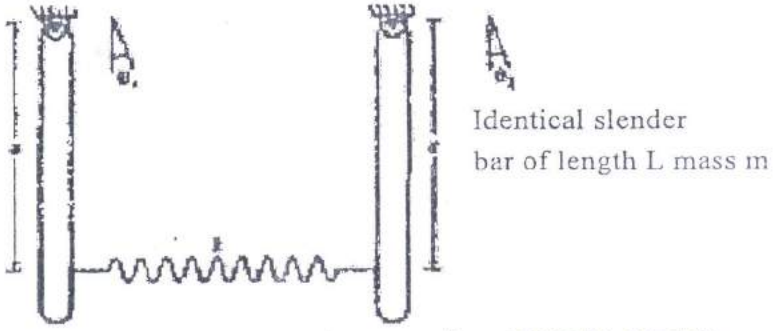
1. (a) Answer any three : 12
(i) Differentiate between viscous and coulomb damping.
(ii) What do you mean by static and dynamic balancing?
(iii) Explain logarithmic decrement for spring mass underdamped system.
(iv) Explain vibration measuring instruments in brief.

(b) Find the natural frequency of oscillation of homogeneous cylinder which rolls on ground without slipping. 8

2. (a) A 500 kg tumbler has an unbalance of 1.26 kg, 50 cm from its axis of rotation. For what stiffnesses of an elastic mounting of damping ratio 0.06 will the tumbler's steady-state amplitude be less than 2 mm at all speed between 200 and 600 rev / min? 10

(b) A machine of 100 kg mass has a 20 kg rotor with 0.5 mm eccentricity. The mounting spring have $K = 85 \times 10^3$ N/m . $\xi = 0.02$ (damping ratio). The operating speed of machine is 600 rpm and unit is constrained to move vertically. Find (i) Amplitude of machine (ii) Force transmitted to the support. 10

3. (a) Use Lagrange's equations to derive the differential equations governing the motion of the system shown in figure using θ_1 and θ_2 as generalised coordinates. 12



Saraswati Education Society Library Kharghar

(b) A vibratory system in a vehicle is to be designed with the following parameters K = 100 N/m, C = 2 Ns/m, m = 1 kg. Calculate the decrease of amplitude from it's starting value after three complete oscillations and the frequency of oscillation. 8

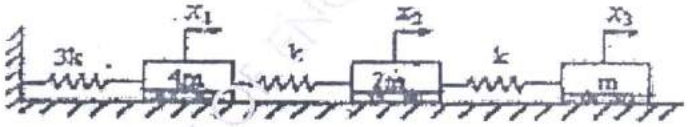
4. (a) A vehicle of mass 1200 kg is travelling on a road surface of which varies sinusoidally with amplitude of 0.05 m and wave length of 6 m. The suspension system has a spring constant of 400 kN/m and damping ratio of 0.50. If the vehicle speed is 100 km/hr. Find the amplitude of the vehicle. 8

(b) 20 N at 20 cm, 10 N at 40 cm, 30 N at 60 cm from the fixed end are the loading conditions on cantilever beam. The deflection under 30 N load due to all loads is 4 mm. Find the natural frequency of the system. What would be the natural frequency if 10 N is added at 40 cm from fix end. The deflection at section 'i' due to unit load at section 'j' is given by 12

$$U_{ij} = \frac{S_i^2\left(3s_j - s_i\right)}{\text{constant}} \text{ for } S_i \not> S_j \text{ and } U_{ij} = U_{ij}$$

where S is the distance of section from fixed end.

5. (a) Find eigen values and eigen vectors of the system shown in figure. 10



(b) A door 2 m high, 1 m wide, 40 mm thick and weighting 350 N is lifted with an automatic door closer. The door opens against a spring with a modulus of 0.1 Nm/rad. If the door is opened 90° and released, how long will it take the door to be with in 2^0 of closing ? Assume the return spring of the door to be critically damped. 10

6 (a) A shaft carries four masses in parallel planes A,B,C and D. The masses at B and C are 18 kg and 12.5 kg respectively and each has an eccentricity of 3 cm. The mass A and D have an eccentricity 4cm. The angle between masses B and C is 100° and that between masses at Band A is 100°. The axial distance between planes A and B is 10 cm and that between B and C is 20 cm. If the shaft is in complete dynamic balance. Determine (i) The masses at A and D. (ii) The distance between planes C and D (iii) The angular position of mass D. 10

Saraswati Education Society
Library
Kharghar

(b) A vibrometer has an undamped natural frequency of 10 Hz and damped natural frequency of 8 Hz. Find the lowest frequency in the range to infinity at which the amplitude can be directly read from the vibrometer with less than 2 percent error. 10

7 (a) The reciprocating mass per cylinder in a 60° V Twin engine is 1.2 kg. The stroke and the connecting rod length are 10cm and 25cm respectively. If the engine runs at 2000 rpm, determine maximum and minimum values of the primary and secondary forces. Also find out the crank positions corresponding to these values. 10

(b) A vertical spring of stiffness 9800 N/m supports a mass of 40 kg. The mass will have a vertical displacement whether upward or downwards in the vertical guideways. These guideways provide a friction force of 49 N. The mass is released from a position in which the total extension of the spring (including stastic deflection) is 12.6 cm. Determine the final extension of the spring in the position in which system comes to rest. 10

KAMALWATI COLLEGE OF ENGINEERING KHARGHAR

May-15

Mech / ~~Auto~~ SEM VI (Mechanical Vibration) Re

Date: 22-5-15

Mech Sub:- MV

Q.P. Code : **4995**

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question No.1 is compulsory.
(2) Answer any three questions from remaining five.
(3) Assume suitable data if required.
(4) Answer to questions showed be poupsed and written together.

1. Answer any four of the following : 20

(a) A spring-mass system has a natural period of 0.25 second. What will be the new period of the Spring constant is :
(i) increased by 60% and (ii) decreased by 30%?

(b) A viscously damped spring-mass-damper systems has mass of 10 kg, damping coefficient of 150 N-s/m, and spring stiffness of 1000 N/m. Determine the values of the damping ratio, damped natural frequency logarithmic Decrement

(c) Two masses of 1kg each are inter connected by a spring of stiffness 10 N/m. Estimate the natural frequencies and draw their corresponding mode shapes.

(d) A mass is suspended from a spring of stiffness 5000 N/m and is subjected to a harmonic force of amplitude 100 N and a frequency of 10Hz. The amplitude of the forced motion of the mass is found to be 20 mm. Find value of the mass.

(e) Explain with a neat sketch, the principle of vibration measuring instruments. .

(f) A rotating unbalance system consists of a disc of mass 2 kg, which is eccentric to the axis of shaft by 2mm. Adding two counter masses of 1kg, each at an axial distance of 1cm. and 2 cm. respectively from either side of the disc, the system is completely balanced. Find the radial location of the counter masses if all the masses lie in the same axial plane.

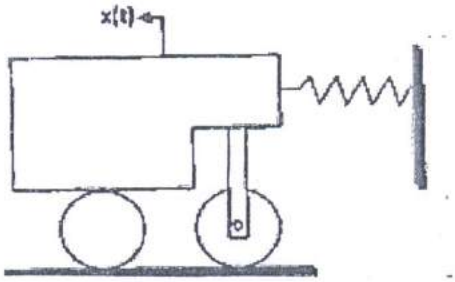
2. (a) The block Shown has a mass M and slides over two rollers having mass m and radius r each. The stiffness of the spring is k. The second roller is pivoted to a light and stiff rod which is connected to the block at the other end. If the block has a harmonic motion x(t), determine the system's undamped natural frequency. 10

Saraswati Education Society Library Kharghar

TURN OVER

Saraswati Education Society Library Kharghar

2. (a)



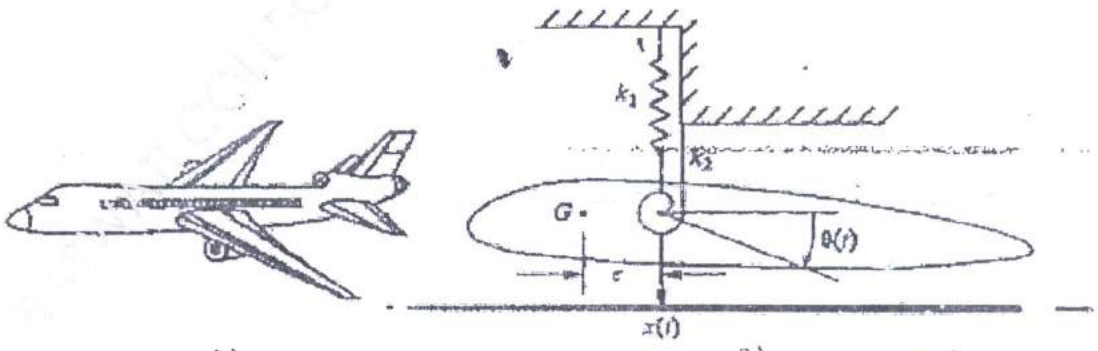
(b) Show that the inertia effect of a shaft of mass moment of inertia J_s can be taken into effect by adding 1/3rd of its value to the mass moment of inertia of the disc J fitted at its end, in order to compute the natural frequency of the system. 5

(c) Define Whirling Speed. Derive the equation for the critical speed of a light shaft with a single disc without damping. 5

3. (a) Explain with a neat sketch, the effect of forcing frequency and damping factor on Displacement Transmissibility. 4

(b) An instrument with mass 13 kg is to be isolated from aircraft engine vibrations ranging from 1,800 to 2,300 cycles per minute. What should be the stiffness of an isolator for at least 65% isolation? Assume that the damping ratio is 0.045. 8

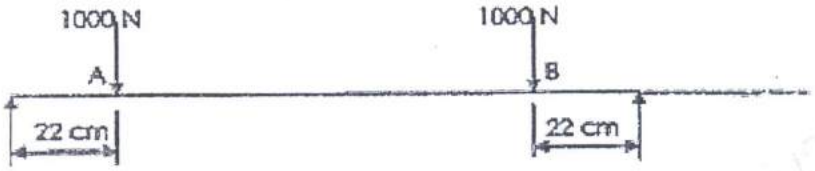
(c) Consider the wing vibration model as shown in the following figure. Using the vertical motion of point attachment of the springs and the rotation of this point, determine the equations of motions using Lagrange's method. G indicates the centre of mass and e denotes the distance between the point of rotation and centre of mass. Ignore the gravitational force. 8



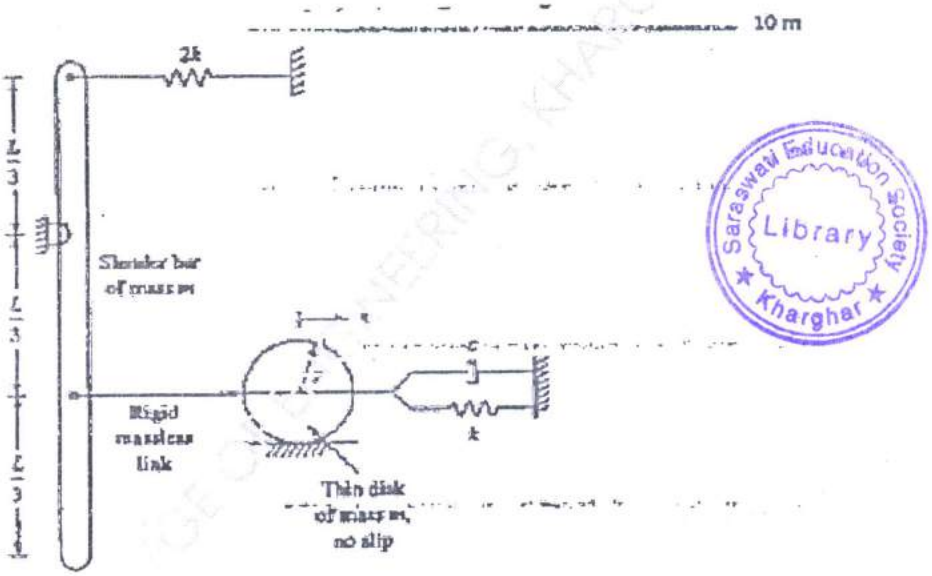
(a) (b)

5.

4. (a) Determine the frequency of transverse vibration of the beam shown in figure below using Dunkerley's and Rayleigh's energy methods. Deflection at A: due to 1000 N at A =1.52mm, due to 1000 N at B = 1.37 mm. 10



(b) Derive the equivalent system parameters for the following figure,taking x as the generalized coordinate. 10



Saraswati Education Society
Library
Kharghar

Saraswati Education Society
Library
Kharghar

5. (a) A 2 kg mass connected to a spring of stiffness 1 kN/m has a dry sliding friction force of 2 N. As the mass oscillates, its amplitude decreases 22cm, How long does this take? 5

(b) Explain why only a part of the unbalance force in reciprocating mass is balanced by revolving mass. Derive the resultant unbalance primary force if c% balancing is achieved. 5

(c) An accelerometer with mass 0.01 kg and a damping ratio 0.707 is to be designed. What should be undamped natural frequency of the system so that the measurement error never exceeds 2%? The vibration signal, which is to be measured, can have a frequency as high as 200Hz. 10

6. (a) The natural frequency and the damping ratio of a vibrometer are 6 Hz and 0.22 Hz, respectively. What is range of frequencies for the measurement error to be below 3%? 10

(b) Four pulleys are equally spaced along a shaft and each has an out of balance mass at the same radius. The out of balance mass in second pulley is 3 kg and the third and fourth out of balance masses are at 75° and 200° to it. Determine the masses in the first, third and fourth pulleys and also the angle of the first mass relative to second if complete balance is to be obtained. 10

WWW.WATICOLLEGEOFENGINEERING.KHARGHAR.COM

(REV) Max-15

~~Auto.~~/Mech. Sem. VI T & FPE Date: 28/5/15

QP Code : 4998

Mech Sub:- T & FPE

(3 Hours) [Total Marks : 80

Question no.1 is compulsory.
Attempt any **THREE** from question no. 2 to 6.
Use of steam table is permitted.

Saraswati Education Society Library Kharghar

Q1) Solve any **Four** 20

a) What is meant by Jet Propulsion? Explain.

b) Write a short note on: Classification of water turbine.

c) Explain briefly the governing system of a Kaplan turbine.

d) Differentiate water tube boilers with fire tube boilers.

e) With neat sketch explain the working of closed cycle gas turbine plant.

Q2) a) Explain the working of a Once through boiler with the help of a neat sketch. 08

b) A 4500 kW gas turbine generating set operates with two compressors stages; the overall pressure ratio is 9:1. A high pressure turbine is used to drive the compressors, and a low pressure turbine drives the generator. The temperature of the gases at entry to the high pressure turbine is 625°C and the gases are reheated to 625°C after expansion in the first turbine. The exhaust gases leaving the low pressure turbine are passed through a heat exchanger to heat air leaving the high pressure stage compressor. The compressors have equal pressure ratios and inter-cooling is complete between the stages. The air inlet temperature to the unit is 20°C. The isentropic efficiency of each compressor stage is 0.8 and the isentropic efficiency of each turbine stage is 0.85, the heat exchanger thermal ratio is 0.8. A mechanical efficiency of 95 % can be assumed for both the power shaft and compressor turbine shaft. Neglecting all pressure losses and changes in kinetic energy calculate: 12

i) the thermal efficiency
ii) work ratio of the plant
iii) the mass flow in kg/s

Neglect the mass of the fuel and assume the following: Cp = 1.005 kJ/kg K, and $\gamma = 1.4$

Q3) a) Derive the expression for the condition for maximum blade efficiency in Parson's reaction turbine. 10

b) A boiler generates 7.5 kg of steam per kg of coal burnt at a pressure of 11 bar, from feed water having a temperature of 70°C. The efficiency of the boiler is 75 % and factor of evaporation is 1.15, specific heat of steam at constant pressure is 2.3 kJ/kg K. Calculate: 10

i. Degree of superheat and temperature of steam generated;

Saraswati Education Society Library Kharghar

ii. Calorific value of coal in kJ/kg
iii. Equivalent evaporation in kg of steam per kg of coal

Q4) a) Obtain the expression for the force exerted by a jet of water on a fixed curved plate when jet strikes at the center of a symmetrical curved plate.

b) Explain the function of following in Reaction water turbine:

i) Guide vane
ii) Scroll casing
iii) Draft tube

c) A single stage steam [illegible] supplied with steam at 5 bar, 200°C at the rate of 50 kg/min. It expands into a condenser at a pressure of 0.2 bar. The blade speed is 400 m/s. The nozzles are inclined at an angle of 20^0 to the plane of the wheel and the outlet blade angle is 30^0. Neglecting friction losses, determine power developed, blade efficiency and stage efficiency.

Q5) a) Discuss and explain: Methods to improve efficiency of a gas turbine.

b) The three jet Pelton turbine is required to generate 10,000 kW under a net head of 400 m. The blade angle at outlet is 15^0 and the reduction in the relative velocity while passing over the blade is 5 %. If the overall efficiency of the wheel is 80 %, Cv = 0.98 and speed ratio = 0.46, then find: (i) the diameter of the jet, (ii) total flow in m^3/s and (iii) the force exerted by a jet on the buckets.

c) What are the effects of friction in a nozzle? Define nozzle efficiency, coefficient of velocity.

Q6) a) Explain the working of a turboprop engine by means of a sketch. What are its advantages, limitations and applications?

b) In a hydroelectric generating plant, there are four similar turbines of total output 220 MW. Each turbine is 90 % efficient and runs at 100 rpm under a head of 65 m. It is proposed to test the model of the above turbine in a flume where a discharge is 0.4 m^3/s under a head of 4 m. Determine the size (scale ratio) of the model. Also calculate the model speed and power results expected from the model.

c) Write a short note on boiler mountings.

BTe sem-VI (Rev) May-June-15
FEA (Rev) Mech/Auto
Date: 9-6-15

Mech Sub:- FEA

QP Code : 5003

(3 Hours) Max. Marks: 80

Note:
1. **Question 1 is Compulsory**
2. Solve any three from remaining five
3. Figures to right indicate full marks
4. Assume suitable data if necessary

Saraswati Education Society Library Kharghar

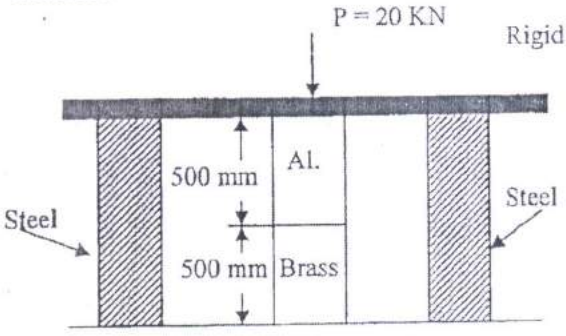
Question No.		Max. Marks
Q.1	a) Explain Pre and post processing in FEM	5
	b) Derive shape function for 1D quadratic element in natural co-ordinates	5
	c) Explain the significance of Jacobian matrix.	5
	d) Explain Convergence of results	5
Q.2	a) Solve the following differential Equation using Galerkin Method.	10

$$\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0 \qquad 0 < x < 1.$$

Boundary Conditions are: $y(0)=1$, $y'(1)=0.1$

Find $y(0.2)$ and compare with exact solution. 10

b) For the given, steel blocks supporting rigid plates shown in figure, determine displacement matrix and stresses in each element.



Take:

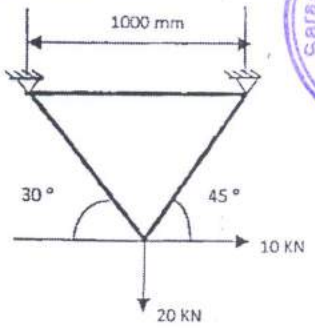
Properties	Steel	Aluminium	Brass
C/S Area (mm^2)	200	370	370
E (N/mm^2)	2×10^5	7×10^4	8.8×10^4

[TURN OVER

Q.3 a) What do you mean by consistent and lumped mass matrices? Derive the same for linear bar element. 10

b) Consider the truss shown in figure. Given E = 210 GPa and cross section area A = 1 cm^2 for each element. Determine 10

1. Displacement at each node.
2. Stresses induced in each element.
3. Reaction at supports

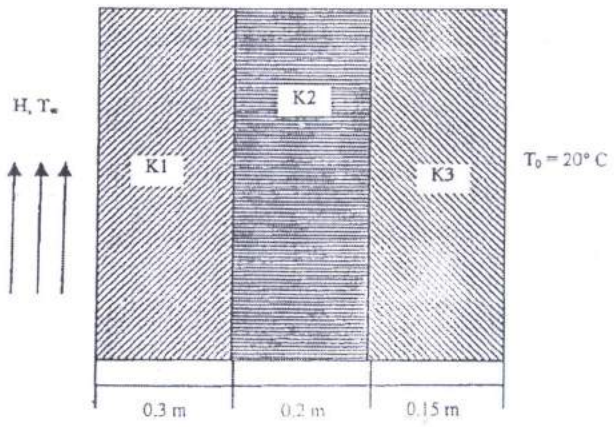


Saraswati Education Society Library Kharghar

Q.4 a) It is required to carry out one dimensional structural analysis of a circular bar of length 'L', fixed at one end and carries a point load 'P' at other end. Find the suitable differential equation with required boundary condition (justify) and solve it by using Rayleigh – Ritz method for two linear element. 10

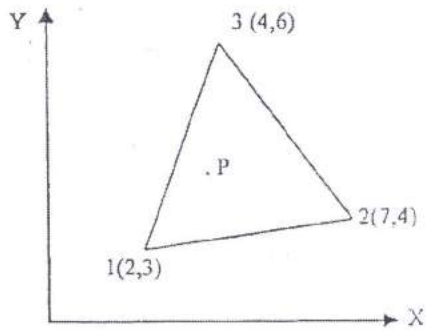
b) A composite wall consists of three materials, as shown in figure. The outer temperature $T_0 = 20°C$. Convection heat transfer takes place on the inner surface of the wall with $T_\infty = 800°C$ and h = 30 W/m^2 °C. Determine temperature distribution in the wall. 10

$K_1 = 25$ W/m-°C
$K_2 = 30$ W/m-°C
$K_3 = 70$ W/m-°C



[TURN OVER

Q.5 a) The nodal coordinate of the triangular element are as shown in figure. At the interior point P, the x-coordinate is (4.5) and N_1=0.3. Determine N_2, N_3 and y-coordinate of point P. 10



Saraswati Education Society Library Kharghar

b) For a CST element the nodal displacement vector Q^T=[0,0,0,0,2,-0.1] mm. Find the element stress. Take E=200GPa, plate thickness t= 5mm and Poisson's ratio = 0.3 10

Q.6 a) What are serendipity elements? Derive and graphically represent interpolation functions for 8 nodded Quadrilateral elements. 10

b) Find the natural frequency of axial vibrations of a bar of uniform cross section of 20mm^2 and length 1m. Take E = 2 x 10^5 N/mm^2 and ρ = 8000 kg/m^3. Take two linear elements. 10