SE, Sem III, AM III, Mech CBGS

Con. 7845-13. **GX-12025**

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

M / 335 Extra

N.B. : (1) Question No. **1** is **Compulsory.**
(2) **Answer** any **Three** from remaining.
(3) **Figures** to the **right** indicate **marks.**

1. (a) Find laplace of $\sin\sqrt{t}$ **5**

(b) Show that the set of functions $\text{Sin}\left(\frac{\pi x}{2L}\right), \text{Sin}\left(\frac{3\pi x}{2L}\right), \text{Sin}\left(\frac{5\pi x}{2L}\right)$ is orthogonal over (O, L). **5**

(c) Show that $u = \sin x \cos hy + 2 \cos x \sin hy + x^2 - y^2 + 4xy$ Satisfies laplace equation and find its corresponding analytic function $f(z) = u + iv$. **5**

(d) Determine constants a,b,c,d if $f(z) = x^2+2axy+by^2 + i(cx^2+2dxy+y^2)$ is analytic. **5**

2. (a) Find complex form of fourier series $f(x) = e^{3x}$ in $0<x<3$. **6**

(b) Using Crank Nicholson Method solve $u_t = u_{xx}$ subject to $u(x,0) = 0$ $u(0, t)=0$ and $u(1,t) = t$ for two time steps. **6**

(c) Solve using laplace transforms $\frac{d^2y}{dt^2} + y = t,\ y(0) = 1, y^1(0) = 0$ **8**

3. (a) Find bilinear transformation that maps the points $0, 1, -\infty$ of the z plane into -5, -1, 3 of w plane. **6**

(b) By using Convolution Theorem find inverse laplace transform of $\frac{1}{(S^2+4S+13)^2}$ **6**

(c) Find fourier series of $f(x) = x^2$ $-\pi \le x \le \pi$ and prove that **8**

(i) $\frac{\pi^2}{6} = \sum_1^\infty \frac{1}{n^2}$

(ii) $\frac{\pi^2}{12} = \sum_1^\infty \frac{(-1)^{n+1}}{n^2}$

(iii) $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$

4. (a) Evaluate $\int_0^\infty e^{-t} \frac{\text{Sin}^2 t}{t}\, dt$ **6**

(b) Solve $\frac{\partial^2 u}{\partial x^2} - 32 \frac{\partial u}{\partial t} = 0$ by **6**

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M
335

Bender schmidt method subject to conditions u(o, t) = 0 u (x, 0) = 0
u(l, t) = t taking h = 0.25 $0 < x < 1$

(c) Obtain two distinct Laurent's Series for $f(z) = \frac{2z-3}{Z^2-4z-3}$ in Powers of (z-4) indicating Region of Convergence. **8**

5. (a) Evaluate $\int_0^{1+i} Z^2 dZ$ along **6**

(i) line y = x
(ii) Parabola $x = y^2$
Is line independent of path? Explian.

(b) Find half range Cosine Series for $f(x) = e^x \quad 0 < x < 1$. **6**

(c) Find analytic function **8**
f(z) = u + iv such that

$$u\text{-}v = \frac{\text{Cosx} + \text{Sinx} - e^{-y}}{2\text{Cosx} - e^{y} - e^{-y}}$$

when $f\left(\frac{\pi}{2}\right) = 0$

6. (a) A tightly streched sting with fixed end points x = 0 and $x = \ell$ in the shape defined by $y = K x (l - x)$ where K is a Constant is released from this position of rest. Find y(x,t) The vertical displacement **6**

if $\frac{\partial^2 y}{\partial t^2} = C^2 \frac{\partial^2 y}{\partial x^2}$

(b) Find image of region bounded by x = 0, x= 2 y = 0 y = 2 in the z plane under the transformation w = (1 + i) Z **6**

(c) Evaluate $\int_0^{2\pi} \frac{d\theta}{25 - 16\cos^2\theta}$ **8**

10-12

Mech sem III CBSG. PP-I

330

45 : 2nd half.13-Avi(au)

Con. 8934-13.

GX-12140

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions out of remaining **five** questions.
(3) **Figures** to **right** indicate **full** marks.
(4) Assume suitable **data** if **necessary**.

Q.1. Write short note on any **four** of following: - (20)

(a) Pattern allowances.

(b) Thermit welding process

(c) Blow moulding process.

(d) Rolling defects.

(e) Important properties of moulding sand.

Q.2. (a) Explain the process of production of seamless tubes by rolling process. (6)

(b) What is weldabiltiy? Discuss various welding defects with their remedies. (8)

(c) With a neat sketch explain the principle of electro slag welding process. (6)

Q.3. (a) Name various methods of powder manufacture techniques in powder metallurgy and explain any one in detail. (8)

(b) Compare TIG and MIG welding process. (8)

(c) Write short note on application of plastics in industries. (4)

Q.4. (a) what is NDT.Explain any two NDT methods in detail. (8)

(a) With a neat sketch explain the working principle of plastic injection moulding process. (6)

(c) List important applications of powder metallurgy technique. (6)

Q.5. (a) with neat sketches explain briefly on "friction welding". (6)

(b) A casting of 50cm × 40cm × 10 cm size solidifies in 20 minutes. Find the solidification time for 40 cm × 30 cm× 5 cm casing under similar conditions. (8)

(c) Differentiate between "soldering" and "brazing" operation. (6)

Q.6. (a) With the help of a neat sketch explain the complete gating system in casting process. (8)

(b) Define the terms "Spread", "Elongation", and "Draft" w.r.t. Rolling process. (6)

(c) Explain vacuum forming process of polymers. (6)

Sem-III (Rev) Mech

Con. 8604-13. SE(Mech)/Sem III(CBSGS)/SOM 04-12-13

GX-12101 4/12/13

(3 Hours) Sub: S.O.M. [Total Marks : 80

N.B. : (1) Question No. 1 is **compulsory.**
(2) Solve **three** question from remaining **five.**
(3) Assume suitable **data** wherever **necessary.**

20

Q.1. Solve any Four Questions :

A Write a short note on Macaulays Method

B What are the characteristics of bending Moment and What do you mean by point of contraflexure

C Prove that $\frac{f_b}{y} = \frac{M}{I} = \frac{E}{R}$

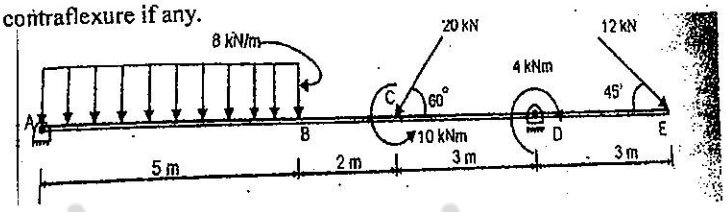
D What is equivalent length of column ? Give the ratio of equivalent length and actual length of column with various end condition

E What is the length of 5 mm diameter aluminium wire so that it can be twisted through one complete revolution without exceeding shear stress of 42 MN/m^2 Modulus of rigidity G= 27 GN/m^2

F Derive an expression for elongation due to self weight of bar

12

Q.2. A Draw SFD, BMD and AFD for the following beam and also show the point of contraflexure if any.

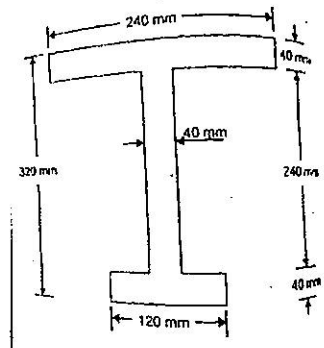


08

B Find the Euler crushing load for a hollow cylinder cast iron column 200 mm external diameter and 25 mm thick , if it is 6 m long and hinged at both ends. Take E= 1.2 x 10^5 N/mm^2 . Compare the load with the crushing load as given by Rankine formula, taking f_c =550 N/mm^2 and a= 1/1600

10

Q. 3 A A cast iron bracket subjected to bending banding has a C/S of I shape with unequal flanges . If the section is subjected to shear force of 120 KN, Draw shear force distribution diagram over the depth of section



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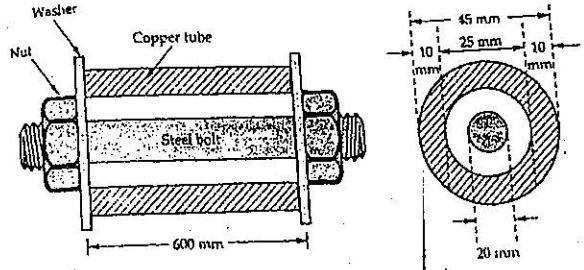
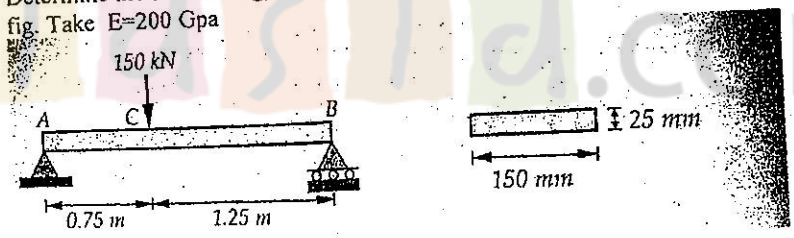
B A Hollow shaft with diameter ratio of 3/8 is required to transmit 500 KW at 100 RPM , the maximum torque being 20 % greater than mean. The maximum shear stress is not exceed 60 N/mm^2 and the twist in the length of 3 m is not exceed 1.4 °. Calculate the minimum diameter required for the shaft . C=84 N/mm^2 10

Q.4. A A wooden beam 250mm x 150 mm has a steel strap 10 mm x 150 mm fixed at the top and the bottom. The beam is subjected to bending moment of 5 KN-m around the horizontal axis . Determine the stress in the steel and wood. Es= 200 GPa, Ew=20 Gpa 10

B A Steel bolt of 20 mm diameter passes centrally through a copper tube of internal diameter 25 mm and thickness 10 mm . The tube is 600 mm long and is closed by rigid washer of negligible thickness and fastened by nuts threaded on the bolt. Find the stresses in the bolt & tube when one of the nuts is tightened by the one quarter of the turn relative to other. The pitch of the thread is 2 mm . Take E_s =200 GPa and E_c=100 Gpa



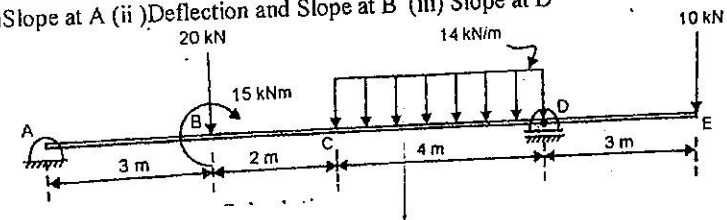
Q. 5. A Determine the strain energy of prismatic beam AB for the loading as shown in fig. Take E=200 Gpa



07

13

B A horizontal beam is loaded and supported as shown in fig . Determine (i)Slope at A (ii)Deflection and Slope at B (iii) Slope at D



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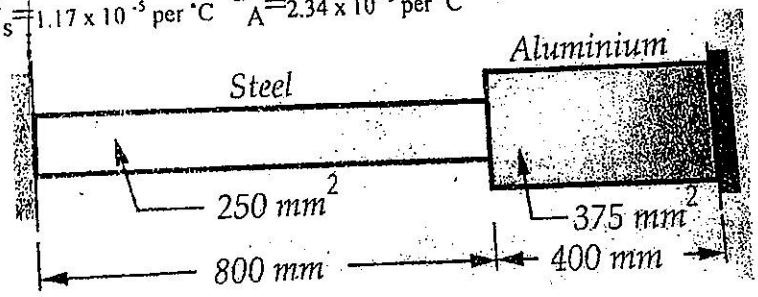
Q.6 A The Composite bar consisting of steel and aluminium components shown in fig Is connected to two grip at a temperature of 60 ° C. Find the stresses in the two rods, when the temperature , falls to 20 ° C 10

(I)If the ends does not yield

(II) If the ends yield by 0.25 mm

Take : $E_S = 2 \times 10^5$ N/mm^2 , $E_A = 0.70 \times 10^5$ N/mm^2.

$\alpha_S = 1.17 \times 10^{-5}$ per °C $\alpha_A = 2.34 \times 10^{-5}$ per °C



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B A cylindrical shell 800 mm in diameter and 3 m long is having 10 mm metal thickness. If the shell is subjected to an internal pressure of 2.5 N/mm^2

Determine (i) The change in diameter

(ii) The change in length

(iii) The change in volume

Assume the modulus of elasticity and poissions ratio of the material of the shell as 200 KN/mm^2 and 0.25 respectively

Mechanical / Thermodynamics / Sem-III CCBSGS)
29/11/13

Con. 7882-13.

GX-12068

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

N.B. : (1) Question No. **1** is **compulsory**.
(2) Attempt any **three** questions out of remaining **five** questions.
(3) Use of steam tabels is permitted.

1. Explain any **four** of the following :- **20**
   (a) State and explain Maxwell relations.
   (b) Claussius inequality.
   (c) Adiabatic flame temperature.
   (d) Second law of thermodynamics.
   (e) Joule's experiment.
   (f) Second law efficiency.

2. (a) Show that the conversion of work into heat is complete and contineous. **4**
   (b) Steam flows into a turbine, at a flow rate of 5000 kg/hr. The turbine develops a power of 550 KW. The heat loss from the casing of the turbine and the bearings is negligible. **12**
      (i) Find the change in enthalpy across the turbine, if the inlet velocity is negligible and exit velocity is 360 m/s and the change in potential energy is negligible.
      (ii) Find the change in enthalpy across the turbine, if the velocity at entry is 66 m/s and the inlet pipe is 3 m above the exit pipe.
   (c) Show that entropy is a property of system. **4**

3. (a) Heat flows through a wall at a rate of 3×10^5 KJ/hr. The temperatures of two faces of the wall are 327°C and 207°C. If the surroundings are at 27°C, What is the loss in available energy? **12**
   (b) State and prove carnot theorm. **8**

4. (a) A carnot heat engine which operates between temperature levels of 927°C and 33°C rejects 30 KJ to the low temperature sink. The heat pump receives 270 KJ of heat from a low temperature reservoir and rejects it to the surroundings at 33°C. Determine the temperature in °C of the low temperature for the heat pump. **12**
   (b) Derive an expression for an air-standard efficiency for otto cycle. **8**

5. (a) Steam at 500 kPa having a quality of 0.9 expands adiabatically and reversibly to a final pressure of 100 kPa. Determine its final condition. **10**

(b) The ultimate analysis of a solid fuel is as follows :- **10**

$C = 78\%$, $O_2 = 3\%$, $H_2 = 3\%$, $S = 1\%$, moisture = 5% and ash content = 10%

Calculate the mass of air supplied. Also calculate individual and total mass of products of combustion per kg of fuel if 30% of excess air is supplied for combustion.

6. (a) In an air-standard dual cycle, the pressure and temperature are 0.1 mPa and 27°C. The compression ratio is 18. The pressure ratio for the constant volume part of heating process is 1.5 and the volume ratio for the constant pressure part of heating is 1.2. Determine :- **12**

(i) thermal efficiency.

(ii) mean effective pressure in M Pa.

(b) State the Clausius clapeyron equation. **4**

(c) Draw a simple schematic of thermal plant with one reheater. Also represent it on T-S-diagram. **4**