S.E / Auto / Civil / Mech / C.B.C.G.S / Sem III / AM-III
23/11/17

Q. P. Code: 25564

(3hours) [Total marks: 80]

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

1. a) Find Laplace transform of $f(t) = te^{-3t}\sin t$. 5

b) Obtain Complex form of Fourier series of $f(x) = e^x, -1 < x < 1$ in $(-1, 1)$. 5

c) Does there exist an analytic function whose real part is $u = k(1 + \cos\theta)$? Give justification. 5

d) The equations of lines of regression are $3x + 2y = 26$ and $6x + y = 31$. Find i) means of x and y, ii) coefficient of correlation between x and y. 5

2. a) Evaluate $\int_0^\infty e^t \sin 2t \cos 3t\, dt$. 6

b) Find the image of the square bounded by lines $x = 0, x = 2, y = 0, y = 2$ in the z-plane under the transformation $w = (1 + i)z + 2 - i$. 6

c) Obtain Fourier series of $f(x) = |x|$ in $(-\pi, \pi)$. Hence, deduce that – 8

$$\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$$

3. a) Find the inverse Laplace transform of $F(s) = \frac{s}{(s^2+9)(s^2+4)}$. 6

b) Solve $\frac{\partial^2 u}{\partial x^2} - 100\frac{\partial u}{\partial t} = 0$, with $u(0,t) = 0, u(1,t) = 0, u(x,0) = x(1-x)$

taking $h = 0.1$ for three time steps up to $t = 1.5$ by Bender –Schmidt method. 6

c) Using Residue theorem, evaluate

i) $\int_0^{2\pi} \frac{d\theta}{5 + 4\cos\theta}$ ii) $\int_{-\infty}^{\infty} \frac{dx}{(x^2+1)^2}$ 8

[TURN OVER]

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4. a) Solve by Crank –Nicholson simplified formula $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$,

$u(0,t) = 0,\ u(5,t) = 100,\ u(x,0) = 20$ taking $h = 1$ for one-time step. 6

b) Obtain the Taylor's and Laurent series which represent the function

$f(z) = \frac{z}{(z-1)(z-2)}$ in the regions, i) $|z| < 1$ ii) $1 < |z| < 2$ 6

c) Solve $(D^2 - 3D + 2)y = 4e^{2t}$ with $y(0) = -3, y'(0) = 5$ where $D \equiv \frac{d}{dt}$ 8

5. a) Find an analytic function $f(z) = u + iv$, if 6

$u = e^{-x}\{(x^2 - y^2)\cos y + 2xy \sin y\}$

b) Find the Laplace transform of $f(t) = t\sqrt{1 + \sin t}$

c) Obtain half range Fourier cosine series of $f(x) = x, 0 < x < 2$ and using Parseval's identity, deduce that –

$$\frac{\pi^4}{96} = \frac{1}{1^4} + \frac{1}{3^4} + \frac{1}{5^4} + \cdots$$

6. a) If $f(a) = \oint_C \frac{3z^2+7z+1}{z-a} dz,\ C: x^2 + y^2 = 4$

find the values of $f(3), f'(1-i)$ and $f''(1-i)$ 6

b) Find the coefficient of correlation between height of father and height of son from the following data, 6

Height of father	65	66	67	68	69	71	73
Height of son	67	68	64	68	72	69	70

c) A tightly stretched string with fixed end points $x = 0$ and $x = l$, in the shape defined by $y = kx(l - x)$ where k is a constant is released from this position of rest. Find $y(x,t)$, the vertical displacement if $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$. 8

SE/ SEM-III/CBSGS/Civil-Mech/AM-IV/23-11-17

Q. P. Code: 11701

(3hours) [Total marks: 80]

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

1. (a) Find Laplace transform of $e^{-4t} \sin 3t \sin t$. 5

(b) Does there exist an analytic function whose real part is $x^3 - 3x^2y - y^3$. Give justification. 5

(c) Show that $\{\cos x, \cos 2x, \cos 3x, \ldots\ldots\}$ is a set of orthogonal functions over an interval $(-\pi, \pi)$. 5

(d) Evaluate $\int_0^{2+i} z^2 dz$ along the line joining the point $z_1 = 0$ and $z_2 = 2 + i$. 5

2. (a) Obtain the Taylor's and Laurent series which represent the function,

$f(z) = \dfrac{1}{(z+1)(z+3)}$ valid in the regions,

(i) $|z| < 1$ (ii) $1 < |z| < 3$ (iii) $|z| > 3$ 6

(b) Find the bilinear transformation which maps the points $z = \infty, i, 0$ into the points $w = 0, i, \infty$. 6

(c) Using Laplace transform, solve the differential equation :

$\dfrac{d^2x}{dt^2} + 4x = t$ with $x(0) = 1, \quad x'(0) = -2$ 8

3. (a) Solve $\dfrac{\partial^2 u}{\partial x^2} - 2\dfrac{\partial u}{\partial t} = 0$ by Bender–Schmidt method, given

$u(0,t) = 0, u(x,0) = x(4-x), u(4,t) = 0$, assuming $h = 1$, find u upto t=5. 6

(b) Using convolution theorem find the inverse Laplace transform of

$\dfrac{s}{(s^2+1)(s^2+4)}$. 6

(c) Determine the solution of one-dimensional heat equation $\dfrac{\partial u}{\partial t} = c^2 \dfrac{\partial^2 u}{\partial x^2}$ under boundary condition $u(0,t) = u(l,t) = 0$, $u(x,0) = x$, l being the length of rod. 8

[TURN OVER]

4. (a) Using Residue theorem, evaluate, $\int_0^{2\pi} \frac{d\theta}{5+3\sin\theta}$. 6

(b) Find the inverse Laplace transform of the following: 6

$$\frac{s^2+2s+3}{(s^2+2s+2)(s^2+2s+5)}$$

(c) Obtain Half Range Sine Series of $f(x) = x(\pi - x)$ in $(0, \pi)$.

Hence, evaluate $-\sum_{m=1}^{\infty} \frac{(-1)^m}{(2m+1)^3}$. 8

5. (a) If $f(x) = e^{-3x}$, $-1 < x < 1$. Obtain Complex form of $f(x)$ in $(-1, 1)$. 6

(b) Find the orthogonal trajectory of the family of curves $3x^2y - y^3 = c$. 6

(c) Solve by Crank –Nicholson simplified formula $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$,

$u(0,t) = 0$, $u(1,t) = 2t$, $u = 0$, for two time steps taking $h = 0.25$. 8

6. (a) Obtain the Fourier series for $f(x)$ where

$$f(x) = x + \frac{\pi}{2} \qquad -\pi < x < 0$$

$$= \frac{\pi}{2} - x \qquad 0 < x < \pi$$ 6

(b) Prove that $\int_0^{\infty} e^{-t} \frac{\sin^2 t}{t} dt = \frac{1}{4}\log 5$ 6

(c) Find bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -1$. Hence, find the image of $|z| \leq 1$ onto the w-plane. 8

S.E / Sem III / Mech & Auto / CBCGS / 29/11/17

Thermo

Q. P. Code: 24252

(Time: 3 Hours) [Total Marks: 80]

N. B. : (1) Question No. 1 is compulsory.
(2) Solve any three out of the remaining five questions.
(3) Assume suitable data if required and state it clearly.
(4) Use of Steam Table and Mollier diagram is permitted.

1. Attempt any four out of the following 20
(a) Define heat engine, refrigerator and heat pump.
(b) Draw a neat diagram of vane type blower and explain its working.
(c) Define i) wet steam, ii) superheated steam, iii) dryness fraction, iv) saturation temperature
(d) What do you understand by mean temperature of heat addition? For a given temperature of heat rejection show how the Rankine cycle efficiency depends on the mean temperature of heat addition.
(e) State the first law for a closed system undergoing a change of state.

2. (a) A reciprocating air compressor takes in 2 m^3/min at 0.11 MPa, 20°C, which it delivers at 1.5 MPa, 111°C to an aftercooler where the air is cooled at constant pressure to 25°C. The power absorbed by the compressor is 4.15 kW. Determine the heat transfer in the compressor and the aftercooler. 10
(b) Derive the first and second Tds equations. 5
(c) A lump of 800 kg of steel at 1250 K is to be cooled 500 K. If it is desired to use the steel as source of energy, calculate the available and unavailable energies. Take specific heat of steel as 0.5 kJ/kg K and ambient temperature 300 K. 5

3. (a) A heat pump working on a Carnot cycle takes in heat from a reservoir at 5°C and delivers heat to a reservoir at 60°C. The heat pump is driven by a reversible heat engine which takes in heat from a reservoir at 840°C and rejects heat to a reservoir at 60°C. The reversible heat engine also drives a machine that absorbs 30 kW. If the pump extracts 17 kJ/s from the 5°C reservoir, determine i) the rate of heat supply from 840°C source, and ii) the rate of heat rejection to the 60°C sink. 10
(b) Determine entropy change of universe, if two copper blocks of 1 kg & 0.5 kg at 150°C and 0°C are joined together. Specific heats for copper at 150°C and 0°C are 0.393 kJ/kg K and 0.381 kJ/kg K respectively. 5
(c) Determine the maximum work obtainable by using one finite body at temperature T and a thermal energy reservoir at temperature T_0, $T > T_0$ 5

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4. (a) A cyclic steam power plant is to be designed for a steam temperature at turbine inlet of 360°C and an exhaust pressure of 0.08 bar. After isentropic expansion of steam in the turbine, the moisture content at the turbine exhaust is not to exceed 15%. Determine the greatest allowable steam pressure at the turbine inlet and calculate the Rankine cycle efficiency for these steam conditions. Estimate also the mean temperature of heat addition. 10

(b) Derive an expression of air standard efficiency for Otto cycle. 5

(c) Define volumetric efficiency of a compressor. On what factors does it depend? 5

5. (a) A mass of air is initially at 260°C and 700 kPa and occupies 0.028 m^3. The air is expanded at constant pressure to 0.084 m^3. A polytropic process with n = 1.50 is then carried out, followed by a constant temperature process which completes the cycle. All the processes are reversible. i) sketch the cycle on p-V and T-s plane, ii) find the heat received and heat rejected in the cycle, and iii) find the efficiency of the cycle. 10

(b) Show that energy is property of a system. 5

(c) Write Maxwell's equations. 5

6. (a) An air standard limited pressure cycle has a compression ratio of 15 and compression begins at 0.1 MPa, 40°C. The maximum pressure is limited to 6 MPa and the heat added is 1.675 MJ/kg. Compute i) the heat supplied at constant volume in kJ/kg, ii) the heat supplied at constant pressure in kJ/kg, iii) the work done per kg of air, iv) the cycle efficiency and v) the m.e.p. of the cycle. 10

(b) A single stage, double acting air compressor is required to deliver 14 m^3 of air per minute measured at 1.013 bar and 15°C. The deliver pressure is 7 bar and the speed 300 rev/min. Take the clearance volume as 5% of the swept volume with a compression and re-expansion index of n = 1.3. Calculate the swept volume of the cylinder, the delivery temperature and the indicated power. 10

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SEM-III / CBSGS / NOV-Dec 17 / Mech & Auto / THERMO

29/11/2017

Q. P. Code: 26050

(3 Hours) [Total Marks 80]

N. B. : (1) Question No **1** is **compulsory.**
(2) Solve any **three** questions from remaining **five** questions.
(3) Assume suitable data if required.
(4) Use of Mollier Chart, Steam table is permitted.

1. Explain any **four** of the following: - 20
   (a) What is PMM-I? Why it is impossible?
   (b) Explain principle of increase of entropy.
   (c) What do you mean by high grade energy and low grade energy? Explain with suitable example
   (d) Draw schematic diagram of Rankine cycle with reheat and also draw its T-S and H-S diagrams.
   (e) Explain Brayton cycle with T-S and H-S diagrams.
   (f) Explain adiabatic flame temperature with its practical significance.

2. (a) Differentiate between – 8
   i) Microscopic and Macroscopic point of view.
   ii) Heat and Work Energy.
   (b) A heat engine operating between two reservoirs at 1000 K and 300 K is used to drive a heat pump which extracts heat from the reservoir at 300 K, at a rate twice that at which the engine rejects heat to it. If the efficiency of the engine is 40% of the maximum possible and the coefficient of performance of the heat pump is 50% of the maximum possible, make calculations for the temperature of the reservoir to which the heat pump rejects heat. Also workout the rate of heat rejection from the heat pump if the rate of supply of heat to the engine is 50 kW. 12

3. (a) A hot iron forging (specific heat 0.5 kJ/kg K) weighs 30 kg and has a temperature of 500°C. The forging is dropped into 200 kg oil mass (specific heat 2.5 kJ/kg K) at 25°C for quenching. Make calculations for the entropy change of forging, entropy change of oil and entropy change of the composite system. It may be presumed that there is no loss of heat to the surroundings. 8
   (b) Distinguish between surrounding work, useful work and reversible work. 6
   (c) "An increase in pressure raises the boiling point of a liquid" substantiate it. 6

4. (a) By burning a fuel, the rate of heat release is 500 kW at 1727°C. Determine the first law and the second law efficiencies if (i) the energy is absorbed in a furnace at the rate of 480-kW at 727°C, (ii) the energy is absorbed at the rate of 450 kW for generation of steam at 227°C, (iii) energy is absorbed in a chemical process at the rate of 300 kW and 47°C. Take T_0 = 300K. 8

(b) A steam power plant operates in a Rankine cycle with superheated steam. The inlet steam conditions are pressure 20bar and temperature 360^0C.The steam undergoes isentropic expansion in the turbine and exhausted to a condenser operating at 0.08bar. Determine the efficiency of the cycle. 8

(c) Define- 4

i. Dryness fraction
ii. Enthalpy
iii. Internal energy
iv. Entropy

5. (a) In an air standard Diesel cycle, the compression ratio is 16. At the beginning of isentropic compression, the temperature is 15^0C and the pressure is 0.1 MPa. Heat is added until the temperature at the end of constant pressure process is 1480^0C. Calculate: (i) the cut-off ratio, (ii) the heat supplied per kg of air, (iii) the cycle efficiency, and (iv) mean effective pressure. 12

(b) Explain flue gas analysis by Orsat apparatus. 8

6. (a) Derive equation for efficiency of Otto cycle. 5

(b) Define stoichiometric air, excess air and air fuel ratio. 5

(c) Define system boundary and surrounding with suitable example and figure. 5

(d) Write down the SFEE on unit mass basis and apply on turbine and nozzle. 5

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Q.P. Code: 27344

Duration: 3 Hours **Total Marks: 80**

N.B.: 1. Question No **1** is **compulsory**
2. Attempt any **Three** questions from the remaining five questions.
3. Assume any **suitable data** if necessary with justification.
4. Figures to the right indicates max. marks

Q.1. Attempt any **four** of the following questions. 20

a) Draw the shear force and bending moment diagram for a cantilever beam with uniformly distributed load and a concentrated load at the free end.

b) A cantilever 3 m long carries a UDL over the entire length. Find the deflection at the free end if the slope at the free end is 3^0.

c) Derive the relation between E G K.

d) Obtain an expression for strain energy stored due to torsion in a solid shaft.

e) A bar of 12 mm in diameter is acted upon by an axial load of 20 KN. The change in diameter is measured as 0.003 mm. Determine (i) the Poisson's ratio and (ii) the modulus of elasticity and the bulk modulus. The value of modulus of rigidity is 80 GPa.

Q.2 a) A steel tube of 35 mm outer diameter and 30 mm inner diameter encloses a gun metal rod of 25 mm diameter and is rigidly joined at each end.If at a temperature of 400C there is no longitudinal stress, determine the stress developed in the rod and the tube when the temperature of the assembly is raised to 240°C. Take, 10

Young's modulus for steel= 205 GPa ,

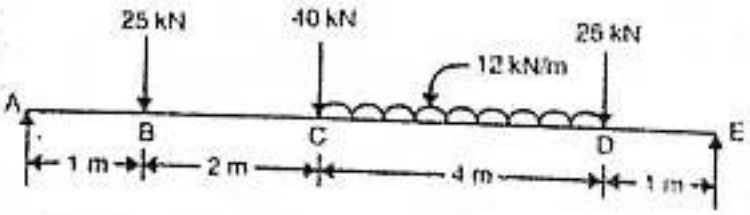
Young's modulus for gun metal = 91.5 GPa

Coefficient of thermal expansion of steel = 11x $10^{-6}/^0$ C

Coefficient of thermal expansion of gun metal = 18 x $10^{-6}/^0$ C.

Also find the increase in length if the original length of the assembly is 1 m.

b) Draw the shear force and bending moment diagram for a simply supported beam as shown in the figure. 10



Q.3 a) The tension flange of a girder of I–section is 240 mm X 40 mm, whereas the compression flange 120 mm X 20 mm. The web is 300 mm deep and 20 mm thick. If the girder is used as simply supported beam of 8 m span, determine the load per m run if the allowable stress is 90 MPa in compression and 30 MPa in tension. 10

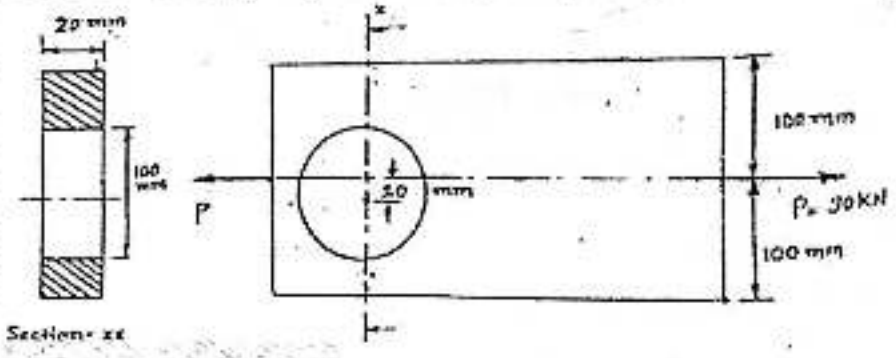
b) A hollow cast iron column whose outside diameter is 300 mm has a thickness of 30 mm. It is 5 m long and fixed at both ends. Calculate the safe load of Rankine formula using a factor of safety 4.Calculate the slenderness ratio and ratio of Euler's critical load to Rankine's critical load.

Take σ_c=550 N/mm^2 and α=1/1600 in Rankine's formula.

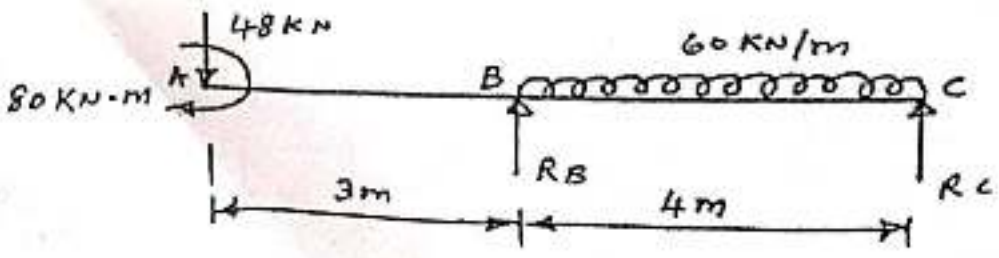
Also take E=8x10^4 N/mm^2 10

Q.4a) A hollow shaft of diameter ratio 3/8is to transmit 600 kW at 110 rpm. The maximum torque being 20% greater than mean. The shear stress is not to exceed $63N/mm^2$and twist in a length of3 m is not to exceed 1.4 degrees. Calculate the external and internal diameters which would satisfy both the above conditions. Take G = 8 x 10^4 N/mm^2 10

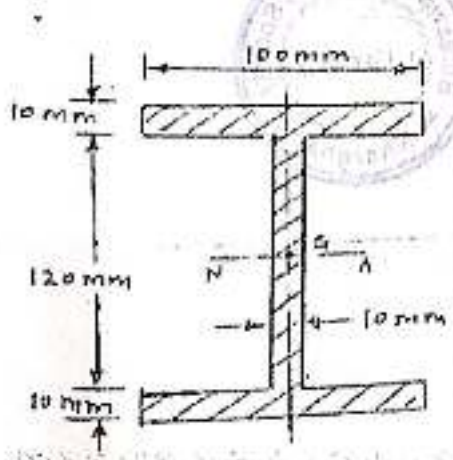
b) Figure below shows a rectangular plate with a hole drilled in it. Determine the greatest and the least intensities of stress at the critical section of the plate when subjected 'to an axial pull of 90 kN. 10



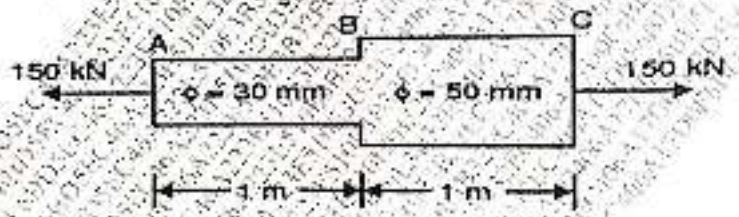
Q.5 a) A simply supported beam is subjected to the loads as shown in the figure. Determine the maximum deflection induced in the beam. Take value of EI = 1·2 x 10^5 N-m^2. 10



b) Draw shear stress variation diagram for a beam section shown in figure. Take SF=100KN. **10**



Q.6 a) A steel rod consist of two equal portions each 1 meter long is as shown find the total strain energy of the rod when it is subjected to an axial pull of 150 KN. Take E-200 X 10^3 N/mm^2 **10**



b) An unknown weight falls by 22 mm on to a collar rigidly connected to the lower end of the vertical bar 3 m long and 500 mm^2 in section. If the maximum instantaneous extension is known to be 2.5 mm, find the corresponding stress and the magnitude of the falling weight. Take E = 2 x 10^5 N/mm^2. **10**

S.E/ Sem III / Mech Engg/ CBCGS/ Sem/ 08/12/12

QP CODE : 27636

3 hours Total Marks: 80

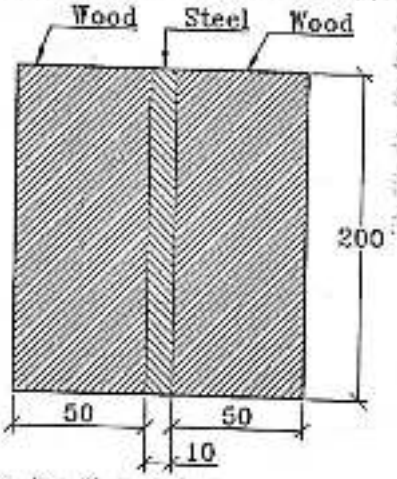
NB

- *Q1 is compulsory. Answer any three from the remaining five questions.*
- *Assume suitable data, wherever required. Clearly state the assumptions and justify the same.*
- *Illustrate answers with sketches, wherever required.*
- *Write legibly with blue or black ink pen. Use pencil only to draw diagrams and graphs.*

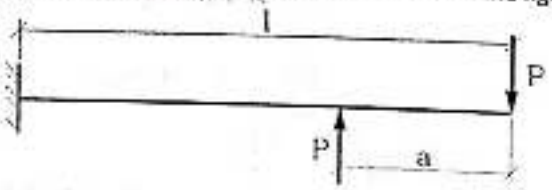
1 *Answer any four of the following:*

a. If a round bar of 37.5 mm diameter and 2.4 m length is stretched by 2.5 mm, find its bulk modulus and lateral contraction. Take, Young's modulus= 110 GN/m² and shear modulus = 42 GN/m² for the material of the bar. *05*

b. A flitched beam consists of steel and timber as shown in figure. Determine the moment of resistance of the beam. Take σ_s= 100 N/mm² and σ_w= 5 N/mm². All Dimensions are in mm. *05*



c. Draw the S. F. and B. M. diagrams for the beam loaded shown in the figure. *05*



d. Calculate the bursting pressure for a cold drawn seamless steel tubing of 60 mm inside diameter and 2 mm wall thickness. Ultimate Strength of steel is 380 N/mm². *05*

e. Find the maximum power that can be transmitted through a 50 mm diameter shaft at 150 rpm, if the maximum permissible shear stress in the shaft is 80 N/mm². *05*

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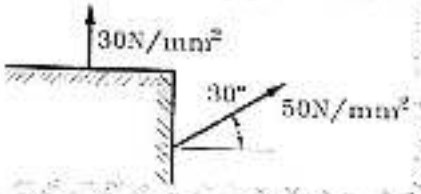
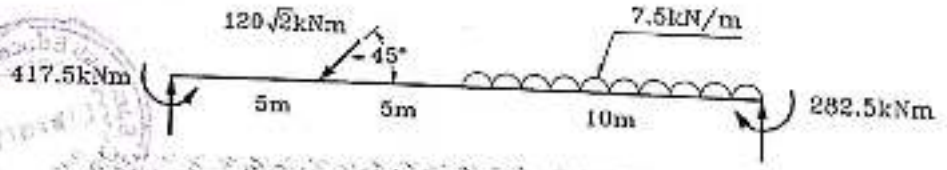
2a. A beam weighing 450 N is held horizontal by three vertical wires, one attached to the middle of the beam and the others to the ends of the beam. The outer wires are of brass with 1.25 mm diameter, and the central wire is of steel with 0.625 mm diameter. Estimate the stresses induced in the wires, assuming that the beam is rigid and the wires are of same length and un-stretched before attaching to the beam. Take Young's moduli of brass as 8.6×10^4 N/mm² and of steel as 2.1×10^5 N/mm². *10*

b. At a point in a material under stress, the intensity of the resultant stress on a certain plane is 50 N/mm² (tensile) inclined at 30° to the normal of that plane. The stress on a plane at right angles to this has a tensile component of intensity 30 N/mm². Find, *10*

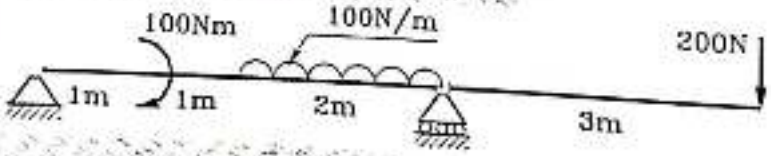
i. The resultant stress on the second plane
ii. The principal planes and stresses
iii. Plane of maximum shear and intensity



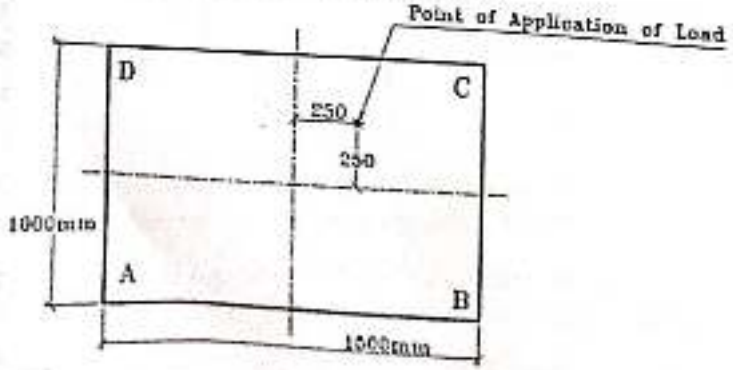
3a. For the beam shown below, draw A. F., S. F. and B. M. diagrams and mark important points. *10*



b. Determine the slope and deflection at the free end of the beam loaded as shown in the figure. E= 200 GPa, I= 14×10^{-6} m⁴. *10*



4a. A rectangular pier is subjected to a compressive load of 450 kN as shown in the figure. Find the stress intensities at the four corners of the pier. *10*



Internal diameter of a hollow shaft is 0.6 of its external diameter. It has to transmit 300 kW power at 80 rpm. If the shear stress is not to exceed 60 N/mm², find the internal and external diameters of the shaft, assuming that the maximum torque is 1.4 times the mean torque. *10*

5a. A 200 kg weight is dropped on to a collar at the lower end of a vertical bar of 3 m long and 28 mm diameter. Calculate the height of drop, if the maximum instantaneous stress is not to exceed 120 N/mm². What is the corresponding instantaneous elongation? Take E= 2 x 10^5 N/mm². *10*

b. A simply supported beam, with a span of 1.3 m and a rectangular cross section of 150 mm wide and 250 mm deep, carries a concentrated load of W at the centre. If the allowable stresses are 7 N/mm² for bending and 1 N/mm² for shear, what is the value of the safe load W? *10*

6a. A hollow cast iron column of 200 mm external diameter, 150 mm internal diameter and 8 m long has both ends fixed. It is subjected to axial compressive load. Taking factor of safety as 6, $\sigma_c = 560\ N/mm^2, \alpha = \frac{1}{1600}$, determine the safe Rankine load. *10*

b. A weight of 200 kN is supported by three adjacent short pillars in a row, each 500 mm² in section. The central pillar is made of steel and the outer ones are of copper. The pillars are adjusted such that at 15 °C, each carries equal load. The temperature is then raised to 115 °C. Estimate the stresses in each pillar at 15 °C and 115 °C. Take: E_s=2x10^5 N/mm², E_c= 0.8x10^5 N/mm², α_s= 1.2x10^{-5}/°C, α_c= 1.85x10^{-5}/°C. *10*

B SE (ETRX/AUTO/CBSGS) P-P-1 / 13/12/17

Sem - III

Q. P. Code: 26345

Time: 3 Hours **[Total Marks: 80]**

NB. A. Question no.1 is compulsory.

B .Attempt any three questions out of remaining five questions

C. Figures to right indicates full marks

1.Solve any Four: [20]

a) What are Transfer machines?

b) Explain Rolling defects.

c) How is rod made by extrusion?

d) With neat sketch explain the working principle of plastic injection moulding process

e) Differentiate Shaper and Planner

2.a) Differentiate the following: [10]

i) Pattern and core boxes.

ii) Lapping and Honing

b) Differentiate between TIG & MIG welding. [5]

c) Differentiate between soldering & brazing. [5]

3.a) Explain rotary swaging with its sketch. [6]

b) Describe Calendaring process for plastic with a neat labeled sketch. [6]

c) How are Milling Machines classified with a neat sketch? Describe any one Milling Machine. [8]

4.a) Explain centreless grinding operation [5]

b) Differentiate between core and core print. [5]

c) What is meant by riser? State the functions of riser. [5]

d) Discuss friction welding with its applications. [5]

5. a) State various vertical machining centres. Describe any one in detail [8]

b) Differentiate between open loop and closed system in CNC machines. [6]

c) Explain vacuum forming process of polymers. [6]

6. a) What is meant by forging? Differentiate closed and open die forging. [5]

b) Write Short note on following: [10]

i) Machine Tools Classification

ii) Automatic machines

c) Compare transfer moulding and compression moulding. [5]

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Q. P. Code: 24188

N.B. A. Question no.1 is **compulsory.** [Total Marks: 80]

B .Attempt any three questions out of remaining five questions

C. Figures to right indicates full marks

1. a) Classify various welding process. [5]

b) Explain Rolling defects. [5]

c) How is rod made by extrusion. [5]

d) Compare transfer moulding and compression moulding. [5]

2. a] Differentiate the following: [10]

i) Pattern and core boxes.

ii) Wing core & hanging type of cores

b] Discuss friction welding with its applications. [5]

c] Differentiate between soldering & brazing. [5]

3. a] Explain rotary swaging with its sketch. [6]

b] Describe Calendaring process for plastic with a neat labeled sketch. [6]

c] Describe the basic steps of powder metallurgy process. Discuss applications, advantages and disadvantages of powder metallurgy. [8]

4. a] What is meant by Sintering. [5]

b] Differentiate between core and core print. [5]

c] What is meant by riser? State the functions of riser. [5]

d] Differentiate between TIG & MIG welding. [5]

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5. a] List the different NDT methods?Explain ultrasonic process method of inspection. [8]

b] Explain with neat sketch "Radiographic Non-destructive test" [6]

c] Expalin vaccum forming process of polymers. [6]

6. a] With neat sketch explain the working principle of plastic injection moulding process. [5]

b] Write Short note on following: [10]

i) Centrifugal casting.

ii) Transfer moulding process

c] What is meant by forging? Differentiate closed and open die forging. [5]

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SE/MECH & AUTO/III/CBCGS/OCT/19-12-17

Q. P. Code: 26048

Time: 3 hours **Max.Marks:80**

NB: 1. **Q.1 is compulsory.**
2. Solve any **three** from the remaining questions.
3. All questions carry equal marks

Q.1 Answer **any FOUR**: (20)

(a) Difference between steels and cast irons
(b) Allotropic modifications of iron
(c) Classification of materials
(d) Modes of deformation in materials
(e) Stainless steels and its classification

Q.2 (A)Define critical cooling rate. Describe various cooling curves on TTT diagram for eutectoid steel and discuss the transformations. (10)
(B)Explain the property and micro-structure changes occurring during cold working and recrystallization annealing of metals. (10)

Q.3 (A)Draw Fe-Fe_3C equilibrium diagram and label all the important temperatures, composition and phases clearly. Also write the invariant reactions. (10)
(B)Describe the cooling of 0.5%C steel to room temperature. Also find out the proportion of micro-constituents in it at room temperature. (10)

Q.4 (A) What is fatigue of metals? Explain the method of testing the metals for fatigue. Discuss the various methods used to increase fatigue life of a component. (10)
(B) What is Hardenability? What are factors affecting hardenability? Explain Jominy End Quench test. (10)

Q.5 (A) How is surface hardening different from case hardening? Discuss any one of the case hardening methods in detail. (10)
(B) A continuous and aligned fibre-reinforced composite is to be produced consisting of 30 vol% aramid fibres in polycarbonate matrix. Find the modulus of the compositein longitudinal direction.(Given: modulus of elasticity for aramid fibre = 131 GPa modulus of elasticity for polycarbonate = 2.4 GPa) (5)
(C) What are smart materials? Discuss a few applications for smart materials. (5)

Q.6 Write short notes on **(Any FOUR)**: (20)

(a) Nano materials and their synthesis route
(b) Creep behaviour in metals
(c) Dislocations and strain hardening
(d) Isomorphous phase diagram
(e) Retained austenite
(f) MR fluids
