BE SEM - III AUTO (CBSGS)

PP-2 / MECH & AUTO / III / OBSGS

16-12-2016

Sub :- PP - I

Q.P. Code : 555100

(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

1. Write short note on any **four** of the following **20**
   (a) Transfer molding process.
   (b) friction welding
   (c) CO2 mould casting
   (d) Extrusion
   (e) Mechanism of sintering

2. (a) With a neat sketch explain the principle and working of resistance welding process. Also discuss its advantages, limitations, and applications. **8**
   (b) Differentiate Welding, soldering and brazing. **6**
   (c) Discuss Rotational Molding process with neat sketch. **6**

3. (a) Describe the basic steps of powder metallurgy process. Discuss applications, advantages and disadvantages of powder metallurgy. **8**
   (b) Describe inspection of castings. **6**
   (c) Write short note on microstructure of welds. **6**

4. (a) What is NDT.List various methods of NDT. Explain Ultrasonic method of crack detection. **8**
   (b) With a neat sketch explain the working principle of plastic injection mounding process. **6**
   (c) What is meant by forging? Differentiate between closed die forging and open die forging. **6**

5. (a) Define weldability. Differentiate between TIG and MIG welding process. **10**
   (b) Describe in detail various rolling defects. **10**

[TURNOVER

6. (a) A cylindrical riser must be designed for a sand casting mould. Casting itself is a rectangular plate made of steel, with dimensions7.5 cm X 12.5 cm X 2.0 cm.Previous observations have indicated that the total solidification time (TST) for this casting is 1.6 min. the cylinder for riser will have D/H ratio= 1. Determine the dimensions of riser so that its TST=2.0 min. **8**

(b) Explain vacuum forming process of polymers. **6**

(c) Write short note on application of plastics in industries. **6**

S.E. Sem-II (Old) Nov-Dec-16

9.12.16

Sub:- SOM

Q.P. Code : 553901

(3 Hours) [Total Marks : 100

N.B. : (1) Q1 is compulsory. Answer any four from the remaining six questions.
(2) Assume suitable data, wherever required.
(3) State the assumptions and justify the same.
(4) Illustrate answers with sketches, wherever required.
(5) Write legibly with blue or black ink pen. Use pencil only to draw diagrams and graphs.

I. Answer any four of the following.

a. Define bulk modulus. Derive an expression for Young's modulus, in terms of bulk modulus and Poisson's Ratio. 5

b. Write the assumptions in simple bending and hence derive the bending formula, $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ 5

c. What is equivalent length of a column? Give the ratio of equivalent length and actual length of columns, with various end conditions. Also, write the expression for crippling load, P for various end conditions. 5

d. Find the maximum shear stress induced in a solid circular shaft of diameter 150 mm, when it transmits 150 kW power at 180 rpm. 5

e. Calculate the maximum bending stress induced in a cast iron pipe of external diameter 40 mm, internal diameter 20 mm and length 4 m, when the pipe is supported at its ends and carries a point load of 80 N at centre. 5

f. A cantilever of length 4 m carries uniformly varying load of intensities zero and free end and 2 kN/m at fixed end. Draw shear force and bending moment diagrams for the beam. 5

II a. A compound tube consists of a steel tube of 140 mm internal diameter and 160 mm external diameter; and an outer brass tube of 160 mm internal diameter and 180 mm external diameter. Both the two tubes are of 1.5 m length. If the compound tube carries an axial compressive load of 900 kN, find its reduction in length. Also, find the stresses and the loads carried by each tube. 10

$E_s = 2 \times 10^5 N/mm^2$, $E_b = 1 \times 10^5 N/mm^2$

[TURN OVER]

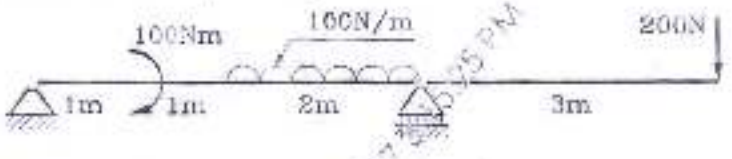
b. A point load of 10 kN applied to a simply supported beam at mid-span, produces a deflection of 6 mm and a maximum bending stress of 20 N/mm². Calculate the maximum value of the momentary stress produced, when a weight of 5 kN is allowed to fall through a height of 18 mm on the beam at the middle of the span. 10

III. a) Two mutually perpendicular planes of an element of material are subjected to tensile stress of 105 N/mm^2, compressive stress of 35 N/mm^2 and shear stress of 70 N/mm^2. Find graphically or otherwise, 10

i. Magnitude and the direction of principal stresses

ii. Magnitude of the normal and the shear stresses on a plane, on which the shear stress is maximum.

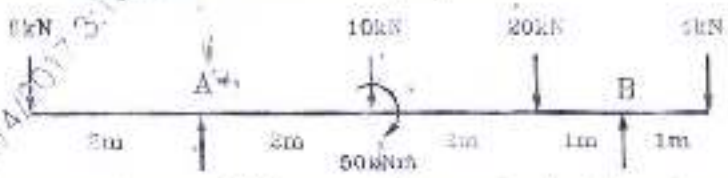
b. Draw shear force and bending moment diagrams for the beam loaded as shown in figure. Locate all important points. 10



IV a. A steel bar 120 mm in diameter is completely encased in an aluminium tube of 180 mm outer diameter and 120 mm inner diameter, so as to make a composite beam. The composite beam is subjected to a bending moment of 15 kN.m Determine the maximum stress due to bending in each material. Assume that Young's modulus of steel is three-times that of aluminium. 10

b. A simply supported beam carries a UDL of intensity 2.5 kN/m over a span of 5 m. The cross-section is T-section having flange 125 mm x 25 mm and web 175 mm x 25 mm. Calculate maximum shear stress for the section of the beam. 10

V a. Determine the position and the amount of maximum deflection for the beam shown in the figure. Take, $EI = 1.8 \times 10^4$ kNm^2 10



b. A square column of 400 mm x 400 mm size is subjected to an axial load of 400 kN. In addition to this, a load of 40 kN is acting at an eccentricity of 20mm about both x-x and y-y axes. Find the stresses at all four corners. 10

[TURN OVER]

VI a. A hollow shaft, having an internal diameter 40% of its external diameter, transmits 562.5 kW power at 100 r.p.m. Determine external diameter of the shaft, if shear stress is not to exceed 60 N/mm², and the twist in a length of 2.5 m should not exceed 1.3°. Assume that the maximum torque is 1.25 time the mean torque and $G = 9 \times 10^4$ N/mm². 10

b. A closed cylindrical vessel made of steel plates 4 mm thick with plane ends carries fluid under a pressure of 3 N/mm2. The diameter of the cylinder is 250 mm and the length is 750 mm. Calculate the longitudinal and hoop stresses in the cylinder wall and determine the changes in diameter, length and volume of the cylinder. 10

$E = 2.1 \times 10^5$ N/mm², $\frac{1}{m} = 0.286$

VII a. 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. 8

b. A simply supported beam AB of 6 m long is loaded with a UDL of 50 kN/m over the entire span. At a section 1.2 m from end A, find SF and BM magnitude to be resisted and draw the shear stress and bending stress distribution diagrams. The cross section of the beam is symmetrical I-section with flanges 200 mm x 20 mm and web 560 mm x 12 mm. 12

SEM / MECH & AUTO / III / CBGS

8-9-16

BE SEM – III AUTO (CBGS) NOV-DEC-2016

Sub :- SOM

Q. P. Code : 555001

Time: 3 Hrs Marks: 80

N. B. 1) Question No. 1 is compulsory.
2) Assume suitable data if necessary.
3) Attempt any Three questions from remaining Five questions.
4) Figures in bracket indicate marks.

Q. 1 **Solve any four** **5x4=20**

a) Draw stress strain curve for ductile and brittle material also Explain factor of safety with the help of stress-strain diagram of both.

b) Define Hoop stress and Longitudinal stress in thin cylinder. Derive their formula.

c) For a rectangular cross section of beam, show that the maximum shear stress is 1.5 times the average shear stress. Also draw shear stress distribution diagram.

d) State Torsion Formula and explain the terms involved in it. Give assumptions in the analysis of pure torsion.

e) Establish the relationship between shear force, bending moment and rate of loading in beam.

Q. 2 **A)** A stepped bar ABCD has the following dimensions: **(10)**

Portion AB: Length 1200 mm and diameter 40 mm.

Portion BC: length 800 mm, diameter 20 mm.

Portion CD: Length 1000 mm, diameter 30 mm.

It is subjected to four point loads as shown in Figure 1. Find the Value of 'P' for equilibrium and then find the change in length of the bar. Assume E = 200 Gpa.

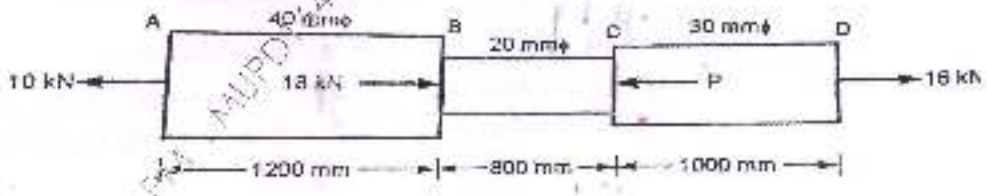


Figure 1

[TURN OVER]

B) A steel block 360 mm X 80 mm X 160 mm is subjected to the following forces (10)

i) A tensile force of 1280 KN on the 160 mm X 80 mm faces (take as a X-direction)

ii) A tensile force of 3456 KN on the 360 mm X 80 mm faces (take as a Y-direction) and

iii) A compressive force of 5184 KN on the 160 mm X 360 mm faces (take as a Z-direction)

Find the changes in the dimensions of the block and also the change in volume. Take E= 2 X 10^5 N/mm^2 and 1/m=0.25

Q. 3 A) A beam 8.5 m long rests on the supports 5 m apart, the beam carries load as shown in Figure 2. Draw SFD and BMD showing all the important points. (10)

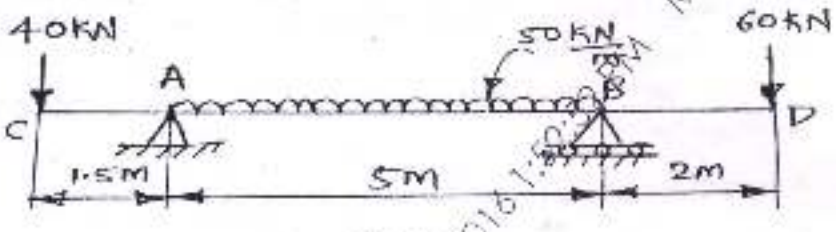


Figure 2

B) A steel bar consists of two equal portions each 1 meter long, the respective diameters of each portion being 30 mm and 50 mm. Find the total strain energy of the bar when it is subjected to an axial pull of 150 KN. (10)
Take E= 200X10^3 N/mm^2 for steel.

Q. 4 A) A symmetrical I-section with flanges 250mm x 20 mm has a web 160 mm X 10 mm. If the shear force acting on the section is 80 KN, find maximum shear stress developed in the section and draw shear stress distribution diagram. (10)

B) A cylindrical shell 3 meter long closed at the ends having 1 meter internal diameter is subjected to an internal pressure of 1.5 MPa. If the thickness of the shell wall is 15 mm, find the circumferential, longitudinal stresses and Maximum shear stress. Find also the change in diameter, Length and volume of the shell. (10)
E=2 X 10^5 N/mm^2, 1/m=0.3

[TURN OVER]

Q. 5 A) Determine the diameter of a solid shaft, which will transmit 300 KW at 250 rpm and the working conditions to be satisfied are: **(10)**

The twist should not be more than 1° in a shaft of length 2 meter and

The maximum shear stress should not exceed 80 N/mm^2

Take, Modulus of rigidity = 1×10^5 N/mm^2

B) Find Euler's crippling load for hollow cylindrical column of 50 mm external diameter and 5 mm thick. Both ends of column are hinged and length of column is 2.5 meter. Take E=2×10^5 N/mm^2. Also determine Rankine's crippling load for the same column. Take fc = 350 MPa and α = 1/7500. **(10)**

Q. 6 A) A 4 m long steel bar of square cross section of 40 mm side, is heated through 75°C with its ends clamped before heating. Calculate the thrust exerted by the bar on clamps: **(10)**

i) if the clamps do not yield

ii) if the clamps yield by 0.6 mm.

Take, E = 210 GPa and $\alpha = 11.5 \times 10^{-6}$ /°C.

B) Find slope and deflection equation for the beam as shown in figure given below. Determine the deflection at a point where couple 50KNm is acting (Figure 3) Take, EI= 2 X 10^4 KN/m^2. **(10)**

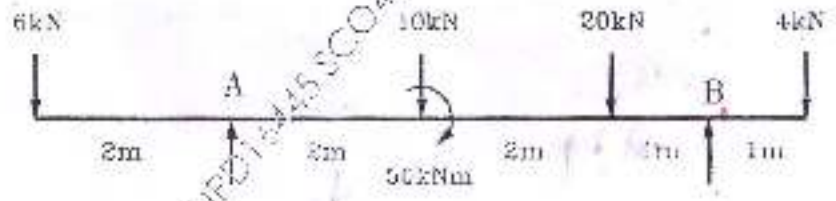


Figure 3

Dt-2/12/16. TD /Mech/ sem-III/CBGS 4Auto.

Q.P. Code : 554900

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

N.B. : (1) Question **No.1** is **Compulsory.**
(2) Answer **any three** from remaining **five** questions.
(3) Assume suitable data wherever required.
(4) Assumptions made should be stated clearly.

1. (a) Explain thermodynamic equilibrium? What is a quasistatic process and quasistatic equilibrium ? **5**
(b) An inventor claims that his engine has following specifications. Power developed=76 kW, Fuel burned per hour=4 kg, Heating value of fuel =75000kJ/kg, Temperature limits 727°C and 27°C. Discuss the possibility of the claim. **5**
(c) Explain Joule-Thompson Coefficient, state its significance. **5**
(d) Derive expression for air standard efficiency of Otto cycle. **5**

2. (a) (i) Apply steady flow equation on boiler, turbine and nozzle. **5**
(ii) Explain principle of increase of entropy. **5**

(b) The power output of a steam turbine is 5MW. The inlet conditions are 2 MPa of pressure, 400°C of temperature, 50m/s of velocity and 10m of elevation. The exit conditions are 15kPa, 0.9 dry quality, 180m/s and 6m elevation. **10**
Compute : (i) The magnitude of Δ h, Δ ke, Δ pe
(ii) Work done per kg of steam
(iii) Mass flow rate of steam.

3. (a) Three Carnot engines E1, E2, E3 operate in series between two heat reservoirs which are at temperature of 1000K and 300K. Calculate intermediate temperatures if amount of work produced by these engines is in the proportions of 5:4:3. **10**
(b) (i) 1 kg of air expands in a non flow process from 10 bar and 167°C to 3 bar and 57°C. Calculate the maximum work that can be obtained from air. **5**
(ii) Explain critical point. **5**

TURN OVER

4. (a) (i) Derive the Maxwell relations. 5

(ii) Define availability, dead state and irreversibility. 5

(b) Explain as how reheating and regeneration in Rankine cycle is beneficial? 10

5. (a) (i) A Diesel engine has compression ratio of 15 and cut off takes place at 6% of the stroke. Find the air standard efficiency. 5

(ii) Explain adiabatic flame temperature. 5

(b) (i) 5 kg of steam is throttled from 12 bar to 0.5 bar pressure. The temperature at the final state is 107°C. Find the following for the initial state: Dryness fraction, specific entropy, and specific volume, mass of liquid and mass of vapour. 5

(ii) What are the assumptions made for air standard cycle? 5

6. (a) The dry products of combustion of hydrocarbon fuel have the following Orsatanalysis: 0.8% CO_2, 1% CO, 8.8% O_2 and 82.2% N_2. Determine the actual as well as theoretical air fuel ratio. The formula for hydrocarbon is of the form CxHy. Take molecular weight of air as 28.95. 10

(b) (i) Draw p-V and T -S diagrams of Atkinson cycle and Stirling cycle, state the processes 5

(ii) Explain higher and lower calorific values. 5

SE CIVIL / III / CBGS / AM-III CIVIL / MECH / AUTO

25/11/16 NOV - DEC - 2016

AUTO SE SEM - III CBGS (AUTO)

SWb - AM - III

Q.P. Code : 538301

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

N.B. (1) Question No.1 is compulsory.
(2) Attempt any three questions out of the remaining five questions.
(3) Figures to right indicate full marks.

1 a) Evaluate $\int_C (\bar{z} + 2z)dz$ along the circle $x^2 + y^2 = 1$ (5)

b) Evaluate the integral using Laplace Transform $\int_0^\infty e^{-t}\left(t\sqrt{1+\sin t}\right)dt$ (5)

c) Determine the analytic function whose real part is $u = -r^2 \sin 3\theta$. (5)

d) A rod of length l has its ends A and B kept at $0^\circ C$ and $100^\circ C$ respectively until steady state conditions prevail. If the temperature at B is reduced suddenly to $0^\circ C$ and kept so while that of A is maintained. Find the temperature $u(x,t)$ at a distance from A and at time t. (5)

2 a) Find complex form of Fourier series of $f(x) = e^{2x}$ in $(0,2)$ (6)

b) Find the orthogonal trajectory of the family of curves given by $2x - x^3 + 3xy^2 = a$ (6)

c) Using Bender Schmidt method solve $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$ subject to the conditions $u(0,t) = 0$, $u(1,t) = 0$, $u(x,0) = \sin \pi x$, $0 \le x \le 1$. Assume h=0.2 (8)

3 a) Find k such that $\frac{1}{2}\log(x^2 + y^2) + i\tan^{-1}\left(\frac{kx}{y}\right)$ is analytic (6)

b) Evaluate $\int_C \frac{1}{(z^3 - 1)^2} dz$ where C is the circle $|z - 1| = 1$ (6)

c) Show that the set of functions $\left\{Sin\left(\frac{\pi x}{2L}\right), Sin\left(\frac{3\pi x}{2L}\right), Sin\left(\frac{5\pi x}{2L}\right), \ldots\right\}$ forms an orthogonal set over the interval $[0, L]$. Construct corresponding orthonormal set. (8)

TURN OVER

4 a) Find Laplace Transform of the periodic function (6)

$$f(t)=\begin{cases}\sin 2t\ ,\ 0<t<\dfrac{\pi}{2}\\ 0,\quad \dfrac{\pi}{2}<t<\pi\end{cases}\Bigg\} f(t)=(t+\pi)$$

b) Find half range sine series for $x\sin x$ in $(0,\pi)$ (6)

c) Expand $f(z)=\dfrac{z^2-1}{z^2+5z+6}$ around $z=1$ (8)

5 a) Using residue theorem evaluate $\int_C \dfrac{e^z}{(z^2+\pi^2)^2}dz$ where C is $|z|=4$ (6)

b) Find Fourier expansion of $f(x)=x+x^2$ in $(-\pi,\pi)$ and $f(x+2\pi)=f(x)$ (6)

c) Find i) $L(e^{-4t}\int_0^t u\sin 3u\,du)$ ii) $L^{-1}\left(\dfrac{1}{s}\log\left(1+\dfrac{1}{s^2}\right)\right)$ (8)

6 a) Show that the function $w=\dfrac{4}{z}$ transform the straight lines $x=c$ in the z-plane into circles in the w-plane. (6)

b) Solve using Laplace Transform $R\dfrac{dQ}{dt}+\dfrac{Q}{c}=V$, $Q=0$ when $t=0$ (6)

c) Solve the Laplace equation $\dfrac{\partial^2 u}{\partial x^2}+\dfrac{\partial^2 u}{\partial y^2}=0$ for the following data by successive iterations (Calculate first two iterations) (8)