Hall Ticket Number :										

R-17

Code: 7G532

II B.Tech. I Semester Supplementary Examinations November 2020

Metallurgy and Material Science

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain how metallic bond is different from other types of chemical bonds 7M

   b) Discuss point defects and line defects 7M

OR

2. a) Describe the mechanism of crystallization in metals 7M

   b) Distinguish between substitutional and interstitial solid solutions 7M

UNIT–II

3. a) Describe methods to construct a phase diagram and explain lever rule 7M

   b) Calcium (melting point 850^0C) and magnesium (melting point 650^0C) form a compound $CaMg_2$ which contains 45% calcium and melts at 716^0C. This compound forms a eutectic with pure magnesium at 516^0C and contains 16% calcium. The solubility of the compound in magnesium is about 2% at the eutectic temperature and decreases to almost zero at room temperature. Magnesium is not soluble in this compound. A second eutectic is formed between the compound and calcium at 444^0C containing 78% calcium, and there is no solid solubility between the compound and pure calcium. Draw the phase diagram on a graph sheet, label the lines and areas. Calculate the composition and relative amounts of eutectic and proeutectic constituents of a alloy containing 50% calcium after eutectic temperature (444^0C). 7M

OR

4. a) Describe a hypothetical phase diagram with a eutectic reaction and how do you relate the properties of alloys of this system with this diagram 7M

   b) In a two component system of A an B an intermediate alloy phase A_mB_n is formed at a peritectic temperature T_P and 30% of B from L+A. The melting points of A and B are T_A and T_B respectively. Further a eutectic reaction occurs at a temperature T_E and 80% of B forming A_mB_n and B from liquid. The maximum composition of B at which the phases liquid and A coexist is 40% B at peritectic temperature and the components are completely insoluble in solid state. Draw this phase diagram and explain equilibrium cooling of an alloy containing 25% B. 7M

UNIT–III

5. a) Describe the composition, microstructure, properties and applications of white cast iron and S G cast iron 7M

   b) Discuss various alloy steels mentioning their applications 7M

OR

6. a) Explain the composition, properties and applications of muntz metal and phosphor bronze 7M

   b) Summarize the effects of copper and silicon on aluminum and specify examples of aluminum alloys containing copper or silicon 7M

UNIT–IV

7. a) Discuss the effect of alloying elements on Fe-Fe_3C diagram 7M

   b) Explain the construction of TTT diagram of eutectoid steel and the information obtained from it 7M

OR

8. a) Describe carburizing and nitriding 7M

   b) Explain the term hardenability and experimental determination of hardenabilty curves. 7M

UNIT–V

9. a) Explain Hand layup and filament winding methods of processing composites 7M

   b) Describe the relative merits of polymer matrix, metal matrix and ceramic matrix composites 7M

OR

10. a) Elaborate steel making using open hearth process 7M

    b) Discuss the application of powder metallurgy 7M

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Hall Ticket Number :										

R-17

Code: 7G534

II B.Tech. I Semester Supplementary Examinations November 2020

Manufacturing Technology

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain Centrifugal casting process and its applications 7M

   b) Mention the causes and remedies of sand casting defects with neat sketches? 7M

OR

2. a) Explain the Investment casting process with neat sketch and its applications 10M

   b) Write the limitations of casting processes? 4M

UNIT–II

3. a) Explain the resistance welding process and write its specific applications? 10M

   b) How is an arc obtained in arc welding? Explain 4M

OR

4. a) Explain the TIG and MIG systems of arc welding with respective applications? 10M

   b) What is meant by weld penetration? Explain it relevant to welding? Explain 4M

UNIT–III

5. a) What is the significance of recrystallization and grain growth in metal forming? 7M

   b) Compare the properties of cold working parts with hot working parts? 7M

OR

6. a) Explain the various forging processes with neat sketches? 10M

   b) Differentiate between coining and embossing? 4M

UNIT–IV

7. a) Explain
   i. Hydrostatic Extrusion ii. Tube Extrusion iii. Impact Extrusion 7M

   b) How the compound die is different from progressive and combination die? Explain with neat sketch 7M

OR

8. a) Explain the Forward extrusion and backward extrusion processes 7M

   b) What are the various forging methods? Explain each one with neat sketch. 7M

UNIT–V

9. a) Explain the common additives used in plastics? 4M

   b) Explain the blow moulding process with neat sketch? 10M

OR

10. a) Write differences between thermoplastics and thermosetting plastics? 7M

    b) Explain the injection moulding process with neat sketch? 7M

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Hall Ticket Number :										

R-17

Code: 7G531

II B.Tech. I Semester Supplementary Examinations November 2020

Mechanics of Solids

(Mechanical Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) A reinforced concrete column is 400mm × 400mm in section. The column is provided with 4 bars each of 30 mm. diameter. The column carries a load of 400kN. Find the stresses in concrete and steel bars. Take Es=210GN/m^2, Ec=14GN/m^2 7M

   b) How did you understand the terms strain energy, resilience and proof resilience? Derive the relation between four elastic constants. 7M

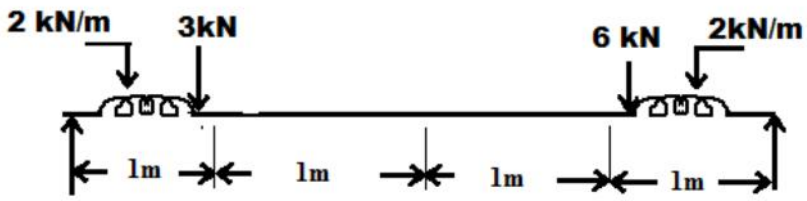
OR

2. A load of 100N falls through a height of 2cm on to a collar rigidly attached to the lower end of a vertical bar 1.5m long and 1.5cm^2 cross sectional area. The upper end of the vertical bar is fixed. Determine

   i) Maximum instantaneous stress induced in the vertical bar.
   ii) Maximum instantaneous elongation.
   iii) The strain energy stored in the vertical rod. Take E=200GPa. 14M

UNIT–II

3. Draw the BM and SF diagrams for the beams shown in figure 2.



14M

OR

4. a) How to find the neutral axis of a beam and explain its importance? 4M

   b) A cantilever beam of cross-section 90mm width and 120mm deep carries a UDL of 12kN/m over the entire span and a concentrated load of 15 kN at the right end. Find the bending stress in the beam, if the length of the beam is 10m. 10M

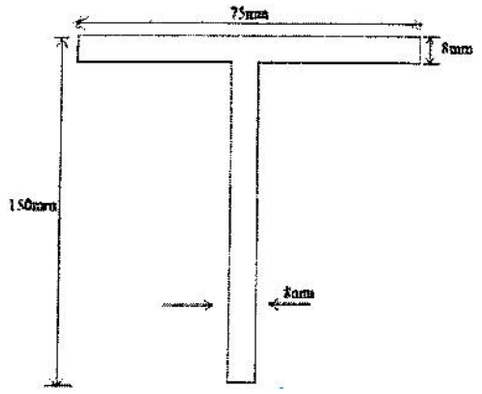
UNIT–III

5. a) The moment of inertia of symmetrical sections of a bean about its neutral axis is 2640 cm^4 and its depth is 20 cm. Determine the longest span over which, when simply supported, the beam would carry a UDL of 6 kN/m run without the stress due to bending not exceeding 1.2 x 10^5 N/mm^2 7M

   b) A rolled steel joist of I-section has flange length of 300 mm wide and 20 mm thick with a web thickness of 20 mm. and overall depth of I-section is 600 mm. If this bean carries a UDL of 40 KN/m over the simply supported beam of span 10 m, find the maximum stress produced in the bean. 7M

OR

6. a) A T-section beam shown in the figure below subjected to a shear force of 9kN at a section. Determine the amount of maximum intensity of shear stress and draw the distribution of shear stress.

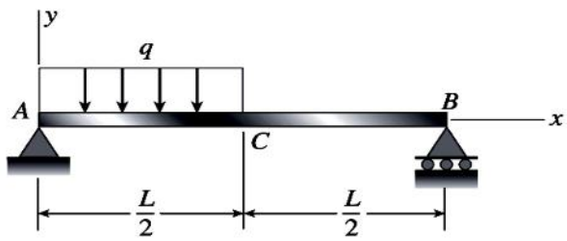


7M

b) A bean of square section is placed so that the plane of bending is parallel to a diagonal, the side of square is 'a' and shear force is 'v'. Obtain an equation of shear stress 'τ' at distance 'y' from N.A and find the bean and maximum intensity of shear stress and where it occurs. 7M

UNIT–IV

7. Derive the equations of the deflection curve for a simple beam AB with a uniform load of intensity q acting over the left-hand half of the span (see figure). Also, determine the deflection δ_C at the midpoint of the beam.



14M

OR

8. A bean of length 6 m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left end support, Find the deflection under each load. Take E=2x10^5 N/mm^2 and I=85x10^6 N/mm^4. 14M

UNIT–V

9. a) A thin cylindrical shell of 3m. long, closed at its ends has an internal diameter of 1.2m and thickness of 16mm. Calculate circumferential and longitudinal stresses induced and also change in length and diameter of the shell, if it is subjected to an internal pressure of 1.6MN/sq. m. Take E=200GN/sq. m and poison's ratio=0.25. 7M

b) A cylindrical shell is subjected to internal fluid pressure. Find an expression for the change in the diameter and length of the cylinder? 7M

OR

10. a) A spherical shell of 1.5m diameter is subjected to an internal pressure of 1.45N/mm^2. Taking the maximum allowable stress as 110Mpa, find the necessary thickness of the plate. Take the joint efficiency at 71%. 7M

b) A thin cylindrical shell 2m long has 800mm internal diameter and 10mm thickness. If the shell is subjected to an internal pressure of 1.5MPa, find

i) The hoop and longitudinal stresses developed
ii) Maximum shear stress induced and
iii) The change in diameter, length and volume.

Take Young's modulus of elasticity of the wall material as 205Gpa and poisons ratio 0.3. 7M

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Hall Ticket Number :										

R-17

Code: 7GC32

II B.Tech. I Semester Supplementary Examinations November 2020

Engineering Mathematics – III

(Common to All Branches)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Find a root of the equation $x^3 - x - 11 = 0$ by using Bisection method.

   b) Find a root of the equation $3x = \cos x + 1$ by Newton-Raphson method, correct to three decimal places.

OR

2. a) Apply Euler's method to solve for y when $x = 0.6$ given that $y' = 1 - 2xy,\ y(0) = 0.$

   b) Using Runge-Kutta method of order 4, compute $y(0.2)$ from

$$10\frac{dy}{dx} = x^2 + y^2,\ y(0) = 1,\ h = 0.1.$$

UNIT–II

3. a) Find the missing term in the following table using Lagrange's interpolation

x	1	2	4	5	6
y	14	15	5	-	9

   b) From the following table, estimate the number of students who obtained marks between 40 and 45.

Marks	30-40	40-50	50-60	60-70	70-80
Number of Students	31	42	51	35	31

OR

4. a) Evaluate $\int_0^1 \frac{1}{1+x^2}dx,$ by using Trapezoidal rule with $h = 0.2.$ Hence determine the value of ®.

   b) Compute the value of $\int_{0.2}^{1.4} (\sin x - \log x + e^x)dx$ using Simpson's $3/8^{\text{th}}$ rule.

UNIT–III

5. a) Find the least squares fit of the form $y = a_0 + a_1 x^2$ to the following data

x	-1	0	1	2
y	2	5	3	0

   b) Solve : $xp - yq = y^2 - x^2.$

OR

6. a) Fit a curve of the form $y = ae^{bx}$ to the following data.

x	0	1	2	3
y	1.05	2.10	3.85	8.30

   b) Using method of separation of variables, Solve $\frac{\partial u}{\partial x} = 4\frac{\partial u}{\partial y},$ given that $u(0, y) = 8e^{-3y}.$

UNIT–IV

7. a) If $f(x)=\begin{cases}-x, & -\pi < x < 0\\ x, & 0 < x < \pi.\end{cases}$

then show that $f(x)=\frac{\pi}{2}-\frac{4}{\pi}\left[\frac{1}{1^2}\cos x+\frac{1}{3^2}\cos 3x+\frac{1}{5^2}\cos 5x+\cdots\right]$.

b) Find a Fourier series to represent $f(x)=|\sin x|$ in the interval $-\pi < x < \pi$.

OR

8. a) Obtain the half range sine series for e^x in $0 < x < 1$.

b) Find the Half range cosine series for the function $f(x)=(x-1)^2$ in the interval $0 < x < 1$.

UNIT–V

9. a) Find the Fourier transform of $f(x)=\begin{cases}1 & \text{for } |x|<1\\ 0 & \text{for } |x|>1.\end{cases}$ Hence evaluate $\int_0^\infty \frac{\sin x}{x}dx$.

b) Find the Fourier Cosine transform of $f(x)=\begin{cases}x, & 0<x<1\\ 2-x, & 1<x<2\\ 0, & x>2\end{cases}$.

OR

10. a) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$.

b) Show that the inverse finite Fourier sine transform of $F_s(n)=\frac{1}{\pi}\left\{1+\cos n\pi-2\cos\frac{n\pi}{2}\right\}$ is

$f(x)=\begin{cases}1, & 0<x<\pi/2\\ -1, & \pi/2<x<\pi\end{cases}$.

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