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Code: 5G533

II B.Tech. I Semester Supplementary Examinations October 2020

Basic Thermodynamics

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

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

UNIT-I

1. a) Explain Quasi- static process with an example
- b) A gas undergoes a reversible non flow process according to the relation $P = (-3V + 15)$ where V is the volume in cubic meter and P is the pressure in bar. Determine the work done where the volume changes from 3 to 6 cubic meters.

OR

2. a) Define Zeroth law of Thermodynamics. Explain how it is basis for the temperature measurement.
- b) Define internal energy of a system and show that it is a property of the system.

UNIT-II

3. a) What are the two statements of Second law of Thermodynamics
- b) An engine operating on a Carnot cycle works within temperature limits of 600 K and 300 K. If the engine receives 2000 KJ of heat evaluate the work done and thermal efficiency of the engine.

OR

4. a) Explain Available energy ,Availability and Irreversibility
- b) Prove Maxwell relations.

UNIT-III

5. a) What is steam quality? Develop relations for specific volume, enthalpy and internal energy for two-phase mixture.
- b) A vessel containing 5 kg of steam at 8 bar and 250°C is cooled by pouring water over the outer surface, till the inside pressure falls to 5 bar. Calculate
 - i) the final state of the steam
 - ii) heat loss
 - iii) loss of internal energy.

OR

6. a) Explain about critical point of steam. Why does the fusion line for water have negative slope?
- b) 10 kg of water at 45°C is heated at a constant pressure of 10 bar until it becomes superheated vapour at 300°C. Find the change in volume, enthalpy, internal energy and entropy.

UNIT-IV

7. a) Explain Vander wall's equation of state and derive the constants for the equation
- b) 0.3 m³ of air at pressure 8 bar expands to 1.5 m³. The final pressure is 1.3 bar. Assuming the expansion to be polytropic. Calculate the heat supplied and change of internal energy. Assume $\gamma = 1.4$.

OR

8. a) State Dalton's law of additive pressure
- b) A gas mixture consists of 0.4 kg CO, 1.1 kg of CO₂ and 1.5 kg of N₂. Determine
 - (i) Mass fraction of each component.
 - (ii) mole fraction of each component .
 - (iii) average molar mass of the mixture .
 - (iv) gas constant of the mixture.

UNIT-V

9. a) Explain the four processes of the Stirling cycle with PV and TS diagrams?
- b) A Diesel engine has a compression ratio of 14 and cut-off takes place at 6% of the stroke. Find the air standard efficiency?

OR

10. a) What is an Air standard cycle? What are the assumptions for Air standard cycles?
- b) In a constant volume cycle the temperature at the beginning and end of the compression are 43°C and 323°C respectively. Calculate the i) air standard efficiency and ii) the compression ratio. Assume $\gamma = 1.4$ for air.

Code: 5GC31

II B.Tech. I Semester Supplementary Examinations October 2020

Engineering Mathematics-III

(Common to CE & ME)

Max. Marks: 70

Time: 3 Hours

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

UNIT-I

1. a) Test for consistency and solve $5x+3y+7z=4$; $3x+26y+2z=9$; $7x+2y+10z=5$ 8M
 b) Show that the Eigen values of diagonal matrix are just the diagonal elements of the matrix 6M

OR

2. a) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ by reducing into Echelon form 7M

- b) Find the Eigen values and eigenvectors of $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$ 7M

UNIT-II

3. a) Find the Cubic polynomial which takes the values. $y(0)=1$, $y(1)=0$, $y(2)=1$ and $y(3)=10$ 7M
 b) Using Newton-Raphson Method, compute $\sqrt{41}$ correct to four decimal places 7M

OR

4. Evaluate $\int_0^6 \frac{1}{1+x} dx$ by using Trapezoidal rule (ii) Simpson's 1/3 rule (iii) Simpson's 3/8 rule. 14M

UNIT-III

5. Using Euler's Method, find an approximate value of y corresponding to $x=1$, given $\frac{dy}{dx} = x + y$ and $y = 1$ when $x=0$. 14M

OR

6. Use Runge-Kutta method to evaluate $y(0.1)$ and $y(0.2)$ given that $y' = x + y$, $y(0)=1$ 14M

UNIT-IV

7. Find the half range sine and cosine series of $f(x) = x$ in $0 < x < 2$ 14M

OR

8. a) Find the Fourier series expansion for $f(x) = e^x$ in $0 < x < 2\pi$ 10M
 b) Form the partial differential equations (by eliminating the arbitrary constants and arbitrary functions) from $z = ax + by + a^2 + b^2$ 4M

UNIT-V

9. a) Apply C-R conditions to $f(z) = z^2$ and show that the function is analytic everywhere. 7M

- b) Evaluate $\int_C \frac{1}{(z-1)(z-3)} dz$ with C: $|z| = 2$ using Cauchy's Integral Formula 7M

OR

10. Determine p such that the function $f(z) = \frac{1}{2} \log(x^2 + y^2) + i \tan^{-1}\left(\frac{px}{y}\right)$ be an analytic function 14M

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R-15

Code: 5G535

II B.Tech. I Semester Supplementary Examinations October 2020

Machine Drawing
(Mechanical Engineering)

Max. Marks: 70

Time: 4 Hours

PART-A

2 X 10 = 20M

Answer the following two questions each carries 10 marks

1. a) Sketch the following thread profiles for a nominal diameter of 25mm and pitch 3mm and give their applications:
 - (i) Buttress thread
 - (ii) Square thread
- b) Draw a hexagonal nut for a Major diameter bolt is 25 mm.

OR

2. Draw Sectional front and top view of double riveted single strap chain butt joint with diameter as 15mm?
3. Draw front and side view of hexagonal headed bolt of nominal diameter 25 mm and a length of 100 mm with a hexagonal nut and washer?

OR

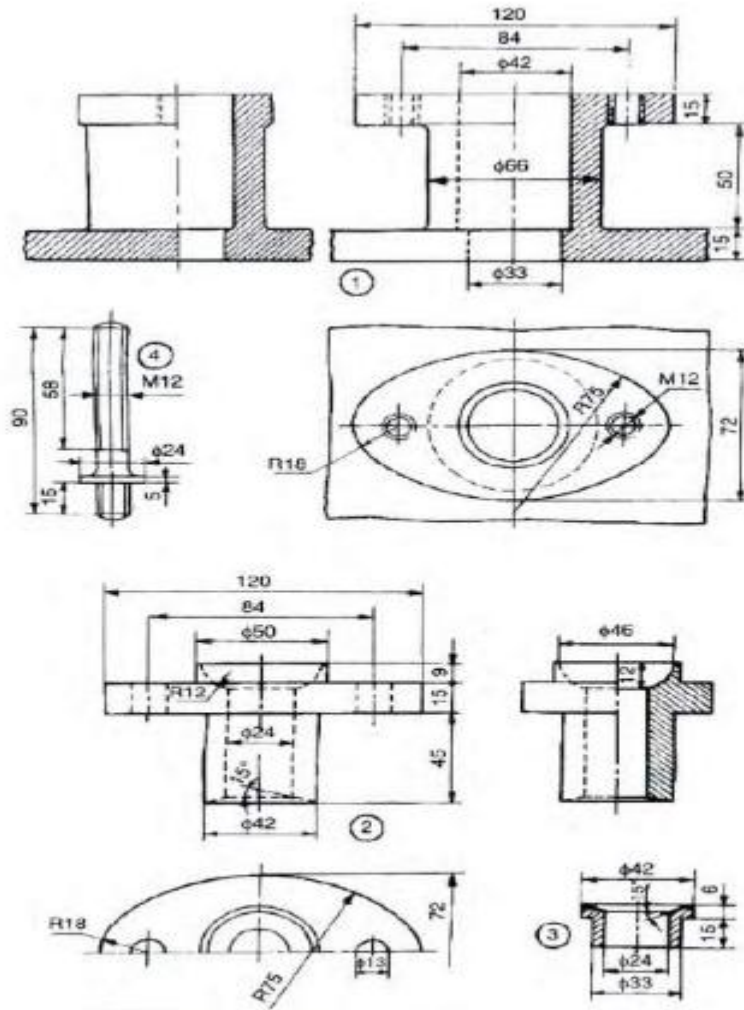
4. Draw Sectional front view and side view of Half-Lap muff coupling using shaft diameter as 30 mm?

Part-B

1 X 25 = 25M

Answer any one of the following carries 25 marks

5. Assemble all the parts of the stuffing box, shown in below figure and draw the following views:
 (a) Half sectional view from the front
 (b) View from above.



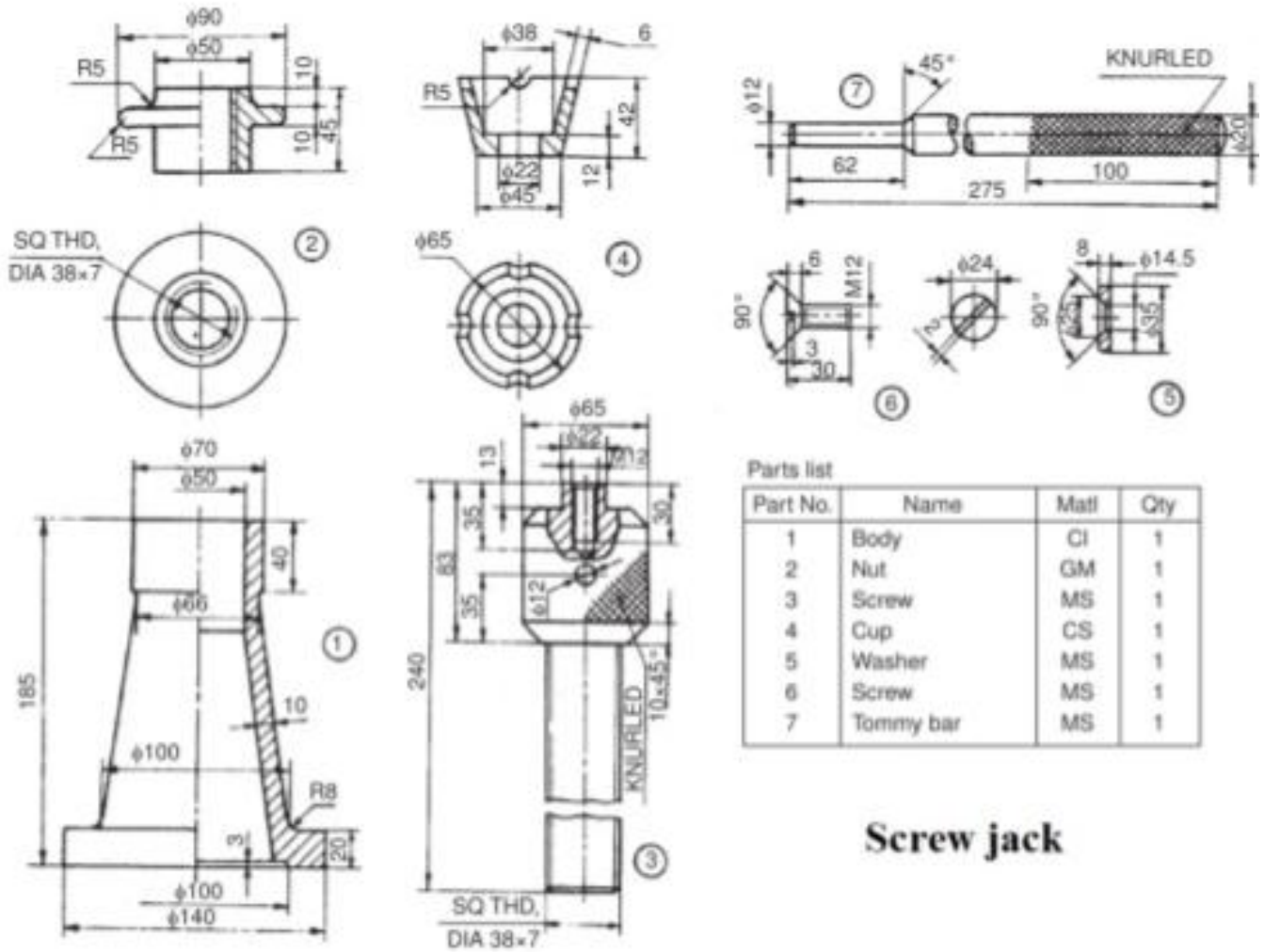
Parts list

| Part No. | Name | Matl | Qty |
|----------|----------|-------|-----|
| 1 | Body | Cl | 1 |
| 2 | Gland | Brass | 1 |
| 3 | Bush | Brass | 1 |
| 4 | Stud | MS | 2 |
| 5 | Nut, M12 | MS | 2 |

OR

6. Assemble all the parts of the screw jack, shown in below figure and draw the following views:

- a) Half sectional view from the front
- b) View from above.



Parts list

| Part No. | Name | Matl | Qty |
|----------|-----------|------|-----|
| 1 | Body | CI | 1 |
| 2 | Nut | GM | 1 |
| 3 | Screw | MS | 1 |
| 4 | Cup | CS | 1 |
| 5 | Washer | MS | 1 |
| 6 | Screw | MS | 1 |
| 7 | Tommy bar | MS | 1 |

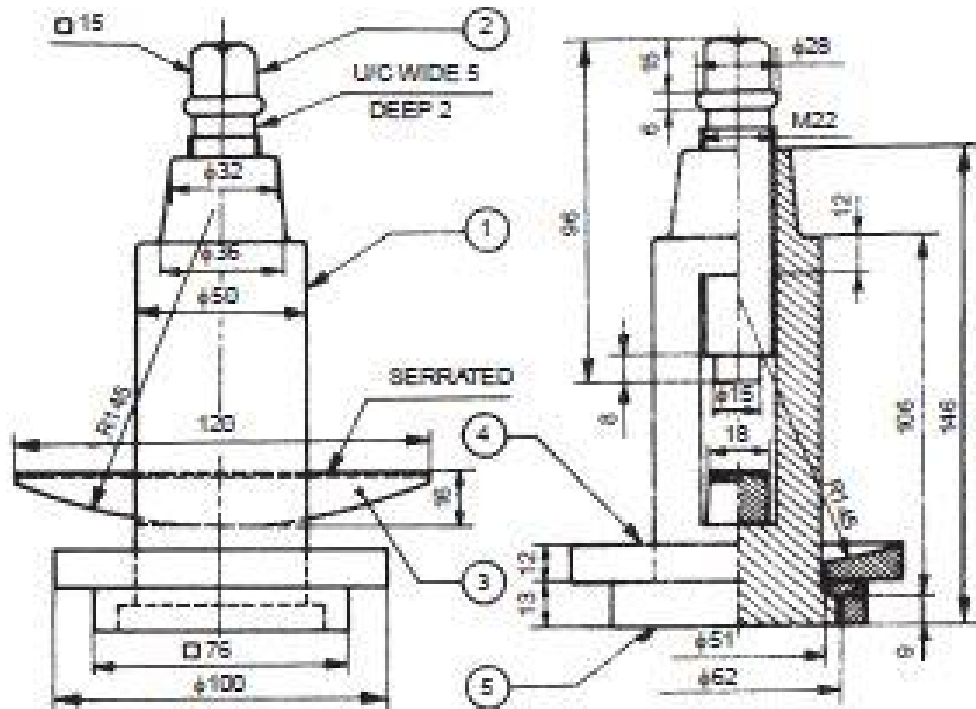
Screw jack

Part-C

Answer any one of the following carries 25 marks

1 X 25 = 25M

7. Prepare the part drawings of the Tool post.

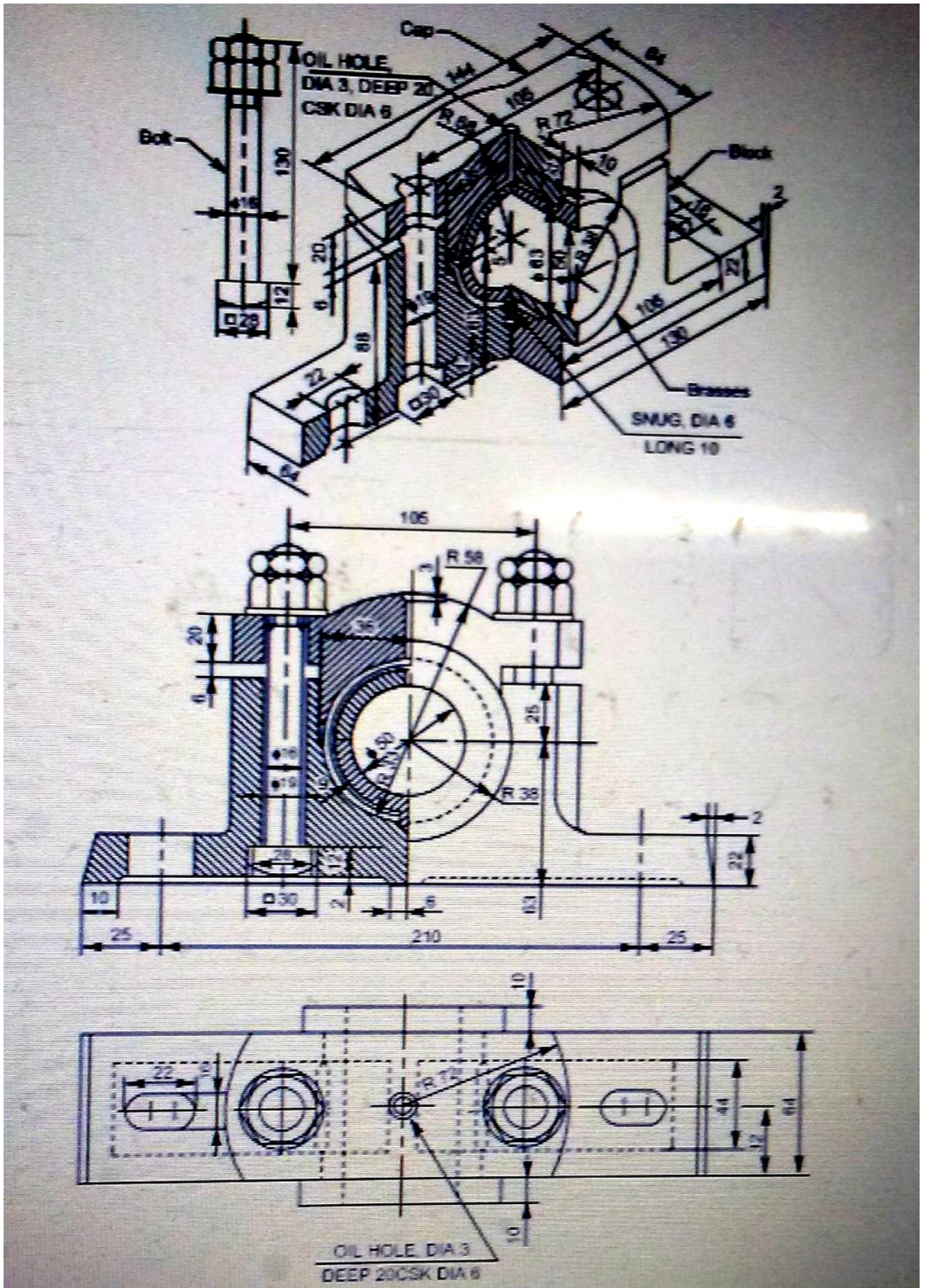


Parts list

| Part No. | Name | Mat. | Qty. |
|----------|--------------|------|------|
| 1 | Body | MS | 1 |
| 2 | Clamp screw | MCS | 1 |
| 3 | Wedge | CI | 1 |
| 4 | Ring | MS | 1 |
| 5 | Square block | MS | 1 |

OR

8. Prepare the part drawings of the plumber block



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| R-15 |
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Code: 5G532

II B.Tech. I Semester Supplementary Examinations October 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 |
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- 1. List the various types of bonds occurring in a crystal. Discuss the metallic bond and its characteristics 14M

OR

- 2. a) What is the necessity of alloying? 7M
b) Write a note on intermediate phases. 7M

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| UNIT-II |
|----------------|

- 3. What are peritectic reactions? And explain the equilibrium diagrams with neat sketch. 14M

OR

- 4. Explain phase rule, Lever rule and composition rule. 14M

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| UNIT-III |
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- 5. Explain the microstructure, properties and applications of Grey Cast Iron. 14M

OR

- 6. a) Explain season cracking in brasses and how it can be prevented? 7M
b) What is dezincification? How it may be minimized? 7M

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| UNIT-IV |
|----------------|

- 7. a) State the objectives of annealing. 7M
b) What is age hardening treatment? 7M

OR

- 8. Describe the steps in construction of TTT diagram with an example 14M

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| UNIT-V |
|---------------|

- 9. Define composites and classify them. Explain any two methods of production of composites. 14M

OR

- 10. Explain Open Hearth process of steel making with neat sketch. List out its advantages and disadvantages. 14M

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Code: 5G531

II B.Tech. I Semester Supplementary Examinations October 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)

UNIT-I

1. a) Explain stress strain diagram for mild steel specimen for tensile test in detail? 7M
 b) Find the modulus of elasticity for a rod which tapers uniformly from 30mm to 15mm in a length of 350 mm .The rod is subjected to an axial load of 5.5kN and extension of the rod is 0.025mm 7M

OR

2. A tensile test was conducted on a mild steel bar .The following data was obtained from the test i) diameter of the steel bar =3 cm ii) gauge length of the bar =20cm iii) load at which elastic limit =250 kN iv) extension at a load of 150 kN is 0.21 mm V) Maximum load=380KN .vi)Total extension =60 mm. viii) diameter of the rod at the failure =2.25 cm. determine the i) young's modulus ii) stress at elastic limit iii) percentage elongation iv)percentage decrease in area . 14M

UNIT-II

3. a) Define shear force, bending moment & point of contra flexure. 7M
 b) Draw shear force diagram and bending moment diagram for a simply supported beam of length 9m carrying a uniformly distributing load of 10KN/m for a distance of 6m from the left end. Also calculate the maximum bending moment on the section. 7M

OR

4. Draw shear force and bending moment diagram for a simply supported beam of length 9m and carrying a UDL of 10KN/m for a distance of 6m from the left end .Also calculate maximum bending on the section 14M

UNIT-III

5. a) State the assumptions made in the theory of simple bending and derive the bending equation? 7M
 b) A rectangular beam 100mm wide and 250mm deep is subjected to a maximum shear force of 50KN.determine i) Average shear stress ii) maximum shear stress and iii) shear stress at a distance 25 mm above the netural axis 7M

OR

6. An I section beam 350 mm x 150 mm has a web thickness of 10 mm and a flange thickness of 20mm .If the shear force acting on the section is 40 KN ,find the maximum shear stress developed in the I section? Sketch the shear stress distribution across the section. 14M

UNIT-IV

7. Derive an expression for max deflections for a simply supported beam subjected to UDL by double integration method. 14M

OR

8. A hollow circular shaft 200 mm external diameter and thickness of metal 25 mm is transmitting power at 200 rpm. The angle of twist over a length of 2 m was found to be 0.5 degrees. Calculate the power transmitted and the maximum shear stress induced in the section. Take modulus of rigidity of material as 84 kN/mm². 14M

UNIT-V

9. A thin cylindrical shell, 2m long has 200 mm diameter and thickness of metal 10 mm. It is filled completely with fluid at atmospheric pressure. If an additional 25000 mm³ fluid is pumped in, find the pressure developed and hoop stress developed. Find also the changes in diameter and length. Take $E=2 \times 10^5 \text{ N/mm}^2$ and $\mu=0.3$. 14M

OR

10. A hollow cast from iron whose outside diameter is 200 mm and has a thickness of 20 mm is 4.5 m long and is fixed at both ends. Calculate the safe load by Rankine's formulae using a factor of safety of 2.5.Find the ratio of Euler's to Rankine's loads. Take $E=1 \times 10^5 \text{ N/mm}^2$ and Rankines constant= $1/1600$ for both ends pinned case and $f_c=550 \text{ N/mm}^2$. 14M

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R-15

Code: 5G534

II B.Tech. I Semester Supplementary Examinations October 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)

UNIT-I

1. Calculate the ratio of solidification times of two steel cylindrical risers of sizes 36cm in diameter by 72 cm height and 72cm in diameter by 36 cm in height subjected to identical conditions of cooling.

OR

2. a) What is a Pattern? Explain the various pattern allowances provided on the pattern?
b) Define the terms
(i) Chaplets (ii) Chills (iii) Core (iv) Casting

UNIT-II

3. a) What are the various types of welded joints with sketch?
b) Explain the following with neat sketches
(i) Arc Welding (ii) Gas welding (iii) Forge welding

OR

4. Compare the following
(i) Brazing and Welding
(ii) Tungsten Inert gas Welding & Metal Inert gas Welding

UNIT-III

5. a) Compare hot working & cold working. State few products made for each of the processes.
b) Explain hot and cold spinning

OR

6. a) Describe two high, four high roll mills.
b) Describe bending & forming operation.

UNIT-IV

7. a) Discuss the forward and backward extrusion process and their advantages, applications of process.
b) Write short notes on (i) Impact Extrusion (ii) Hydrostatic Extrusion

OR

8. a) Describe coining and embossing process of forming.
b) Describe few defects of rolled products and state their remedies

UNIT-V

9. a) Classify plastics. And state their applications.
b) Describe compression moulding process and state its applications.

OR

10. a) Describe injection moulding process and state its applications.
b) Describe blow moulding process and state its applications.
