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17MAT31

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Mathematics – III

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Find the Fourier series expansion for the periodic function f(x), if in one second

$$f(x)=\begin{cases}0; & -\pi<x<0\\ x; & 0<x<\pi\end{cases}$$

(08 Marks)

b. Expand the function $f(x) = x(\pi - x)$ over the interval $(0, \pi)$ in half range Fourier cosine series. **(06 Marks)**

c. The following value of function y gives the displacement in inches of a certain machine part for rotations x of a flywheel. Expand y-in terms of Fourier series upto the second harmonic.

Rotations	x	0	$\pi/6$	$2\pi/6$	$3\pi/6$	$4\pi/6$	$5\pi/6$	π
Displacement	y	0	9.2	14.4	17.8	17.3	11.7	0

(06 Marks)

OR

2 a. Find the Fourier series expansion for the function :

$$f(x)=\begin{cases}\pi x; & 0\le x\le 1\\ \pi(2-x); & 1\le x\le 2\end{cases}$$

and deduce $\frac{\pi^2}{8}=\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}$. **(08 Marks)**

b. Expand in Fourier series $f(x) = (\pi - x)^2$ over the interval $0 \le x \le 2\pi$. **(06 Marks)**

c. The following table gives the variations of periodic current over a period T.

t (secs)	0	T/6	T/3	T/2	2T/3	5T/6	T
A (Amps)	1.98	1.30	1.05	1.30	–0.88	–0.25	1.98

Expand the function (periodic current) by Fourier series and show that there is a direct current part of 0.75 amp and also obtain amplitude of first harmonic. **(06 Marks)**

Module-2

3 a. Find Fourier transform of $f(x)=\begin{cases}1-x^2; & |x|<1\\ 0; & |x|>1\end{cases}$

and hence evaluate $\int_0^{\infty}\frac{x\cos x-\sin x}{x^3}dx$. **(08 Marks)**

b. Find Fourier Cosine transform of the function :

$$f(x)=\begin{cases}4x; & 0<x<1\\ 4-x; & 1<x<4\\ 0; & x>4\end{cases}$$

(06 Marks)

c. Find z-transforms of : i) $a^n \sin n\theta$ ii) $a^{-n}\cos n\theta$. **(06 Marks)**

OR

4 a. Find Fourier sine transform of $f(x) = e^{-|x|}$ and hence evaluate : $\int_0^\infty \frac{x \sin mx}{1+x^2} dx, m > 0$. **(08 Marks)**

b. Find z-transform of $u_n = \cos h\left(\frac{n\pi}{2} + \theta\right)$. **(06 Marks)**

c. Solve the difference equation using z-transforms $u_{n+2} + 6u_{n+1} + 9u_n = 2^n$ .Given $u_0 = u_1 = 0$. **(06 Marks)**

Module-3

5 a. If θ - is the acute angle between the two regression lines relating the variables x and y, show that $\text{Tan}\theta = \left(\frac{1-r^2}{r}\right)\left(\frac{\sigma_x \sigma_y}{\sigma_x^2 \sigma_y^2}\right)$. **(08 Marks)**

Indicate the significance of the cases $r = \pm 1$ and $r = 0$.

b. Fit a straight line $y = ax + b$ for the data.

x	12	15	21	25
y	50	70	100	120

(06 Marks)

c. Find a real root of the equation by using Newton-Raphson method near x = 0.5, $xe^x = 2$, perform three iterations. **(06 Marks)**

OR

6 a. Compute the coefficient of correlation and equation of regression of lines for the data :

x	1	2	3	4	5	6	7
y	9	8	10	12	11	13	14

(08 Marks)

b. The Growth of an organism after x – hours is given in the following table :

x (hours)	5	15	20	30	35	40
y (Growth)	10	14	25	40	50	62

Find the best values of a and b in the formula $y = ae^{bx}$ to fit this data. **(06 Marks)**

c. Find a real root of the equation cos x = 3x – 1 correct to three decimals by using Regula – False position method, given that root lies in between 0.6 and 0.7. Perform three iterations. **(06 Marks)**

Module-4

7 a. Find y(8) from y(1) = 24, y(3) = 120, y(5) = 336, y(7) = 720 by using Newton's backward difference interpolation formula. **(08 Marks)**

b. Define f(x) – as a polynomial in x for the following data using Newton's divided difference formula. **(06 Marks)**

x	–4	–1	0	2	5
f(x)	1245	33	5	9	1335

c. Evaluate the integral $I = \int_0^6 \frac{dx}{4x+5}$ using Simpson's $\frac{1}{3}$rd rule using 7 ordinates. **(06 Marks)**

OR

8 a. For the following data calculate the differences and obtain backward difference interpolation polynomial. Hence find f(0.35). **(08 Marks)**

x	0.1	0.2	0.3	0.4	0.5
f(x)	1.40	1.56	1.76	2.0	2.28

b. Using Lagrange's interpolation find y when x = 10.

x	5	6	9	11
y	12	13	14	16

(06 Marks)

c. Evaluate $\int_0^1 \frac{x}{1+x^2}\,dx$ by Weddle's rule considering seven ordinates. **(06 Marks)**

Module-5

9 a. Verify the Green's theorem in the plane for $\int_C (x^2+y^2)dx + 3x^2y\,dy$ where C – is the circle $x^2+y^2 = 4$ traced in positive sense. **(08 Marks)**

b. Evaluate $\int_C (\sin z.dx - \cos x dy + \sin y dx)$ by using Stokes theorem, where C – is the boundary of the rectangle $0 \le x \le \pi$, $0 \le y \le 1$ and $z = 3$. **(06 Marks)**

c. Find the curve on which the functional : $\int_0^1 [y'^2 + 12xy]dx$ with y(0) = 0, y(1) = 1 can be extremised. **(06 Marks)**

OR

10 a. Given $f = (3x^2 - y)i + xzj + (yz - x)k$ evaluate $\int_C f \cdot dr$ from (0, 0, 0) to (1, 1, 1) along the paths $x = t$, $y = t^2$ and $z = t^3$. **(08 Marks)**

b. Derive Euler's equation in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(06 Marks)**

c. Prove that the shortest distance between two points in a plane is a straight line. **(06 Marks)**

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17MATDIP31

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Additional Mathematics – I

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Prove that $(1 + \cos\theta + i\sin\theta)^n + (1 + \cos\theta - i\sin\theta)^n = 2^{n+1}\cos^n\left(\frac{\theta}{2}\right)\cos\left(\frac{n\theta}{2}\right)$ **(08 Marks)**

b. Express $\sqrt{3}+i$ in the polar form and hence find its modulus and amplitude. **(06 Marks)**

c. Find the sine of the angle between vectors $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 3\hat{j} + 2\hat{k}$ **(06 Marks)**

OR

2 a. Express $\frac{3+4i}{3-4i}$ in the form x + iy. **(08 Marks)**

b. If the vector $2\hat{i} + \lambda\hat{j} + \hat{k} = 0$ and $4\hat{i} - 2\hat{j} - 2\hat{k}$ are perpendicular to each other, find λ. **(06 Marks)**

c. Find λ, such that the vectors $2\hat{i} - \hat{j} + \hat{k}$, $\hat{i} + 2\hat{j} - 3\hat{k}$, $3\hat{i} + \lambda\hat{j} + 5\hat{k}$ are coplanar. **(06 Marks)**

Module-2

3 a. If $y = e^{a\sin^{-1}x}$, prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2 + a^2)y_n = 0$ **(08 Marks)**

b. With usual notations, prove that $\tan\phi = r\frac{d\theta}{dr}$. **(06 Marks)**

c. If $u = \log_e\frac{x^3 + y^3}{x^2 + y^2}$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 1$. **(06 Marks)**

OR

4 a. Using Maclaurin's series, expand $\tan x$ upto the term containing x^5. **(08 Marks)**

b. Find the pedal equation of $r = a(1 - \cos\theta)$. **(06 Marks)**

c. If $u = x + 3y^2 - z^3$, $v = 4x^2yz$ and $w = 2z^2 - xy$, find $\frac{\partial(u, v, w)}{\partial(x, y, z)}$ at (1, –1, 0). **(06 Marks)**

Module-3

5 a. Obtain a reduction formula for $\int_0^{\pi/2}\cos^n x\,dx$, $(n > 0)$. **(08 Marks)**

b. Evaluate $\int_0^a \frac{x^7}{\sqrt{a^2 - x^2}}dx$ **(06 Marks)**

c. Evaluate $\int_1^2\int_1^3 xy^2\,dx\,dy$ **(06 Marks)**

OR

6 a. Obtain a reduction formula for $\int_0^{\pi/2} \sin^n x\,dx$, $(n > 0)$. **(08 Marks)**

b. Evaluate $\int_0^{2a} x^2\sqrt{2ax - x^2}\,dx$ **(06 Marks)**

c. Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-z}^{x+z}(x + y + z)\,dx\,dy\,dz$ **(06 Marks)**

Module-4

7 a. A particle moves along the curve $x = 2t^2$, $y = t^2 - 4t$ and $z = 3t - 5$, where 't' is the time. Find its velocity and acceleration vectors and also magnitude of velocity and acceleration at $t = 1$. **(08 Marks)**

b. In which direction of the directional derivative of x^2yz^3 is maximum at (2, 1, –1) and find the magnitude of this maximum. **(06 Marks)**

c. Show that $\vec{F} = (y + z)\hat{i} + (x + z)\hat{j} + (x + y)\hat{k}$ is irrotational. **(06 Marks)**

OR

8 a. If $\phi = xy^2z^3 - x^3y^2z$, find $\nabla\phi$ and $|\nabla\phi|$ at (1, –1, 1). **(08 Marks)**

b. If $\vec{F} = (x + y + 1)\hat{i} + \hat{j} - (x + y)\hat{k}$, show that $\vec{F}$. Curl $\vec{F} = 0$. **(06 Marks)**

c. If $x = t^2 + 1$, $y = 4t - 3$, $z = 2t^2 - 6t$ represents the parametric equation of a curve, find the angle between the tangents at $t = 1$ and $t = 2$. **(06 Marks)**

Module-5

9 a. Solve : $\left(x\tan\frac{y}{x} - \frac{y}{x}\sec^2\frac{y}{x}\right)dx = x\sec^2\frac{y}{x}dy$ **(08 Marks)**

b. Solve : $xy(1 + xy^2)\frac{dy}{dx} = 1$ **(06 Marks)**

c. Solve : $\frac{dy}{dx} + \frac{y\cos x + \sin y + y}{\sin x + x\cos y + x} = 0$ **(06 Marks)**

OR

10 a. Solve : $(3y + 2x + 4)dx - (4x + 6y + 5)dy = 0$ **(08 Marks)**

b. Solve : $(1 + y^2)dx = (\tan^{-1}y - x)dy$ **(06 Marks)**

c. Solve : $(y \log y)dx + (x - \log y)dy = 0$. **(06 Marks)**

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17ME32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019

Material Science

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define APF and coordination number. Calculate the APF for HCP structure. **(08 Marks)**

b. Differentiate Edge dislocation and screw dislocation. **(05 Marks)**

c. State and explain Fick's I and II law diffusion. **(07 Marks)**

OR

2 a. List the mechanical properties in plastic range. Explain them briefly. **(08 Marks)**

b. With neat sketch, explain S-N diagram and creep curve. **(12 Marks)**

Module-2

3 a. Define solid solution. Explain the different types of solid solutions. **(07 Marks)**

b. Explain the factors affecting the formation of solid solution. **(05 Marks)**

c. Explain Lever rule and Gibbs phase rule with an example. **(08 Marks)**

OR

4 a. Draw Fe-Fe_3C diagram and indicate the phase temperatures and also write the invariant reaction. **(12 Marks)**

b. What is homogenious nucleation? Obtain an expression for critical radius of Nuclei. **(08 Marks)**

Module-3

5 a. Draw TTT diagram for 0.8% C and super-impose the cooling curves. Explain briefly. **(10 Marks)**

b. With neat sketch, explain hardening and tempering heat treatment processes. **(10 Marks)**

OR

6 a. Explain the Age hardening of Al-Cu alloys. **(05 Marks)**

b. With neat sketches explain Flame Hardening. **(06 Marks)**

c. List the properties and applications of Gray cast Iron, Malleable Cast Iron and S.G. Iron. **(09 Marks)**

Module-4

7 a. Define ceramics and what are its types? **(06 Marks)**

b. Enumerate Electrical and Mechanical properties of ceramics. **(08 Marks)**

c. Write the uses of plastics in the various field of engineering. **(06 Marks)**

OR

8 a. Differentiate the thermo plastics and thermo setting plastics. **(05 Marks)**

b. With a neat sketch explain the processing of plastics using injection moulding method. **(10 Marks)**

c. Write a note on properties and applications of smart materials. **(05 Marks)**

Module-5

9 a. Define composites. Give its classification. **(05 Marks)**

b. With a neat sketch, explain pultrusion process. **(08 Marks)**

c. What are the advantages and applications of composites? **(07 Marks)**

OR

10 a. Derive an equation for Young's modulus of FRP composites using:

i) Iso-strain condition

ii) Iso-stress condition **(14 Marks)**

b. Calculation the tensile modulus of elasticity of unidirectional carbon fibre reinforced composite material contains 62% by volume of carbon-fibres in

i) Iso-stress condition

ii) Iso-strain condition

Take: $E_{carbon\ fibre} = 37.86 \times 10^4\ N/mm^2$

$E_{epoxy} = 42 \times 10^2\ N/mm^2$ **(06 Marks)**

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17ME33

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Basic Thermodynamics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of Thermodynamic Data Handbook is permitted.

Module-1

1 a. Define the following with examples :
i) Open system ii) Closed system iii) Isolated system
iv) Path function v) Point function. **(10 Marks)**

b. In 1709, Newton proposed a linear temperature scale where ice point and normal human body temperature are assumed as two fixed points of 0°N and 12°N respectively. The temperature of human body on the Celsius scale is 36°C. Obtain relation between Newton scale and Celsius scale. **(10 Marks)**

OR

2 a. Obtain the expression for displacement work
i) Isothermal process ii) Polytropic process
iii) Isobaric process iv) Isochroric process.
Draw the P-V diagram for each process. **(10 Marks)**

b. Determine the total work done by a gas system following expansion process as shown below: Fig Q2(b).

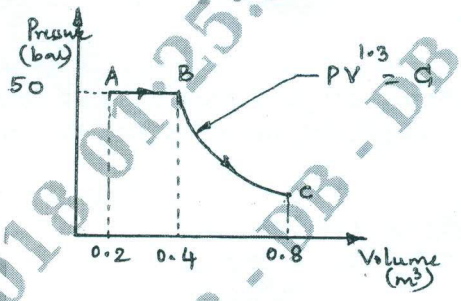

Fig Q2(b) **(10 Marks)**

Module-2

3 a. Apply steady flow energy equation to each of following :
i) Boiler ii) Nozzle iii) Centrifugal pump iv) Throttling device v) Turbine. **(10 Marks)**

b. A Piston and cylinder machine contains a fluid system which passes though a complete cycle of four process. During a cycle, the sum of all heat transfers is -170kJ. The system completes 100 cycles per min. Complete the following table showing the method for each item and compute the net rate of work output in kW. **(10 Marks)**

Process	Q (kJ/ min)	W (kJ/min)	ΔE (kJ/min)
a – b	0	2170	?
b – c	21000	0	?
c – d	– 2100	?	– 36600
d – a	?	?	?

OR

4 a. Prove that Kelvin – Planck statement and Clausius statements of second law of thermodynamic are equivalent. **(08 Marks)**

b. State Carnot's theorem. **(02 Marks)**

c. A reversible heat engine operates between two reservoirs at temperature of 600°C and 40°C. The engine drives a reversible refrigerator which operates between reservoirs at temperature of 40° and -20°C. The heat transfer to the heat engine is 2000kJ and net work output of combined engine refrigerator plant is 360kJ. Evaluate the heat transfer to the refrigerant and net heat transfer to the reservoir at 40°C. **(10 Marks)**

Module-3

5 a. Explain how free expansion and friction makes the process irreversible. **(08 Marks)**

b. What is internal and external irreversibility? **(04 Marks)**

c. Show that entropy is a property of a system. **(08 Marks)**

OR

6 a. State and prove Clausius inequality. **(10 Marks)**

b. 0.5 Kg of air initially at 27°C is heated reversibly at constant pressure until the volume is doubled and is then heated reversibly at constant volume untill the pressure is doubled. For the total path, find the work transfer, heat transfer and change of entropy. **(10 Marks)**

Module-4

7 a. Explain the concept of Available and Unavailable energy. **(04 Marks)**

b. Write a note on Maxwell relations. **(06 Marks)**

c. A vessel of volume $0.04m^3$ contains a mixture of saturated water and saturated steam at a temperature of 250°C. The mass of liquid present is 9Kg. Find the pressure, mass, specific volume, enthalpy, entropy and internal energy. **(10 Marks)**

OR

8 a. With a neat sketch, explain the working of combined separating and throttling calorimeter. **(10 Marks)**

b. Steam at 0.8MPa, 250°C and flowing at the rate of 1Kg/s passes into a pipe carrying wet steam at 0.8MPa, 0.95 dry. After adiabatic mixing, the flow rate is 2.3 Kg/s. Determine the condition of steam after mixing, Neglect the velocity of steam in the pipeline. **(10 Marks)**

Module-5

9 a. State and explain i) Dalton's Law ii) Amagat's law. **(08 Marks)**

b. Define the following : i) Dry bulb temperature ii) Wet bulb temperature iii) Specific humidity iv) Relative humidity **(04 Marks)**

c. A mixture of gases has the following volumetric composition

CO_2 = 12%
O_2 = 4%
N_2 = 82%
CO = 2%

Calculate : i) the gravimetric composition
ii) Molecular weight of mixture
iii) R of mixture **(08 Marks)**

OR

10 a. Derive Vander Waal's constant interms of critical properties. **(08 Marks)**

b. Explain the following : i) Compressibility factor
ii) Law of corresponding states. **(04 Marks)**

c. Determine the mass of Nitrogen contained in a $35m^3$ vessel at 200 bar and 200 K by using i) Ideal gas equation ii) Compressibility chart. **(08 Marks)**

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17ME/MA34

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Mechanics of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Derive the expression for elongation in taper round bar of length 'l', tapering uniformly for diameter 'd_1' to 'd_2' and subjected to an axial load of 'F' modulus of elasticity is E. **(10 Marks)**

b. Find the elongation in a bar loaded as shown in Fig.Q.1(b). Take modulus of elasticity for steel E_S = 200GPa, for copper E_C = 100 GPa and for aluminium E_A = 70GPa. **(10 Marks)**

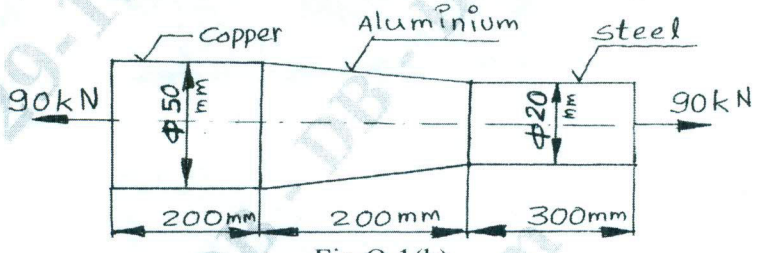

Fig.Q.1(b)

OR

2 a. Derive relation between Young's modulus "E" and rigidity modulus "G". **(10 Marks)**

b. A steel rail 12.6m long is laid at temperature of 24°C. The maximum temperature is 44°C. Estimate the minimum gap between the rails so that the temperature stresses do not develop. Also calculate the thermal stresses developed in rails if no gap is provided between rails. If an expansion of 2mm is allowed, what is the stress induced. Take E = 200GPa, $\alpha = 12 \times 10^{-6}$/°C. **(10 Marks)**

Module-2

3 a. Derive an expression for normal and shear stresses on an oblique plane inclined at 'θ' with vertical axis (x-plane) in a biaxial system subjected to stresses σ_x and σ_y on mutually perpendicular axes. **(08 Marks)**

b. For an element loaded as shown in the Fig.Q.3(b), find:
i) Normal and shear stresses along inclined plane BE.
ii) Principal stresses and their angles
iii) Maximum shear stress and shear planes. **(12 Marks)**

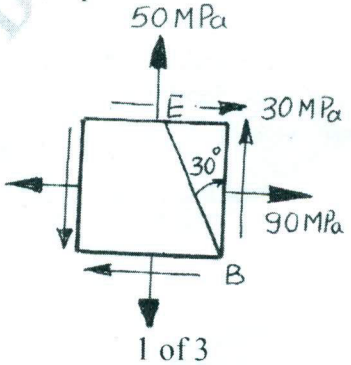

Fig.Q.3(b)

OR

4 a. Derive expressions for circumferential and longitudinal stresses for a thin cylinder of diameter 'd', length '*l*' and thickness 't' subjected to internal pressure 'p'. **(10 Marks)**

b. A pipe of internal diameter 300mm and wall thickness of 100mm contains fluid under a pressure of 6MPa. Calculate and sketch the radial and hoop stresses induced across the wall. **(10 Marks)**

Module-3

5 Draw the shear force and bending moment diagrams for a beam loaded as shown in Fig.Q.5. Determine the location of point of contraflexure. Also find maximum bending moment and its location. **(20 Marks)**

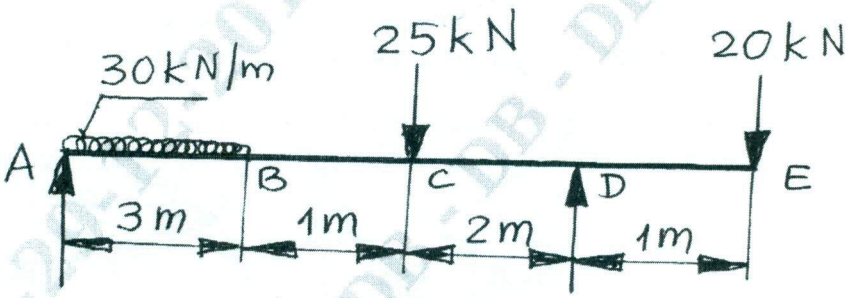

Fig.Q.5

OR

6 a. Derive the equation of bending $\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$. **(10 Marks)**

b. A simply supported beam of span 3m has T-cross section. The flange is 100mm × 20mm and the web is 200mm × 12mm, with the flange in compression. The maximum compressive stress is to be limited to 90MPa. Find the maximum intensity of UDL that can be carried and the corresponding tensile stress induced. **(10 Marks)**

Module-4

7 a. Derive the equation of torsion $\frac{T}{J} = \frac{\tau}{r} = \frac{G\theta}{l}$. **(10 Marks)**

b. A shaft transmits 180kW at 240rpm. The allowable shear stress is 72MPa.

i) Find the diameter of solid shaft.

ii) Also find the diameters of hollow shaft if the inside diameter is 0.6 times its outside diameter.

iii) What is the percentage of saving of material if both shafts are of same material and length? **(10 Marks)**

OR

8 a. Derive an expression for Euler's critical load for a column with both ends pinned. **(10 Marks)**

b. Find the Euler's critical load for a column 1.2m long of rectangular cross section 90mm wide, 60mm depth with both ends hinged. Modulus of elasticity is 200GPa. Compare it with Rankine's critical load taking Rankine's constants σ = 300 MPa and $\alpha = \frac{1}{7500}$. **(10 Marks)**

Module-5

9 a. Derive an expression for strain energy for a member subjected to axial load. **(05 Marks)**

b. Explain Castigliano theorem – I. **(05 Marks)**

c. A round rod 120mm diameter, 1.8m long transmits 300kW at 900rpm. Find the maximum strain energy stored by the rod. Take G = 80,000 N/mm^2. **(10 Marks)**

OR

10 a. Define:

i) Strain energy

ii) Modulus of resilience

iii) Toughness **(06 Marks)**

b. Find the diameter of round rod subjected to a bending moment of 1.8 kN-m and a torque of 1.2 kN-m, according to

i) Maximum normal stress theory

ii) Maximum shear stress theory.

Take allowable normal stress as 120MPa and allowable shear stress as 72 MPa. **(14 Marks)**

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17ME35A

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Metal Casting and Welding

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Define casting process. Explain steps involved in casting process. **(10 Marks)**

b. What is pattern? Discuss the importance of providing various allowances to the pattern. **(06 Marks)**

c. Define core. Give its classification. **(04 Marks)**

OR

2 a. With a neat sketch explain the working of Jolt moulding machine. **(08 Marks)**

b. Explain investment moulding process with necessary sketches listing its advantages and disadvantages. **(10 Marks)**

c. List the functions of a Riser. **(02 Marks)**

Module-2

3 a. Explain Hot chamber pressure die casting process with a neat sketch. **(08 Marks)**

b. Explain continuous casting process with a neat sketch. **(08 Marks)**

c. Classify melting furnaces. **(04 Marks)**

OR

4 a. With a neat sketch describe the construction and working of cupola furnace. **(10 Marks)**

b. Describe the construction and working of Direct Arc Electric furnace with neat sketches. **(10 Marks)**

Module-3

5 a. Define solidification. List solidification variables. **(04 Marks)**

b. List and explain the methods of achieving directional solidification. **(08 Marks)**

c. Why the degasification in liquid metals is necessary? Discuss briefly the methods of removing entrapped gases in liquid metals. **(08 Marks)**

OR

6 a. Name the casting defects. Explain their causes and remedies. **(08 Marks)**

b. With a neat sketch explain the stir casting process. **(08 Marks)**

c. Mention the advantages and limitations of casting process. **(04 Marks)**

Module-4

7 a. Define welding. Classify the welding processes. **(04 Marks)**

b. Explain Metal-Inert-Gas (MIG) welding process with a neat diagram. **(08 Marks)**

c. Explain spot welding process mentioning its applications. **(08 Marks)**

OR

8 a. Explain the thermit welding process with sketch listing its advantages and applications. **(10 Marks)**

b. With a neat diagram, explain electron beam welding process. Mention its advantages, disadvantages and applications. **(10 Marks)**

Module-5

9 a. Brief about formation of different zones in welding process. **(05 Marks)**

b. Define Brazing. Brief about Torch brazing process. **(07 Marks)**

c. Explain Oxy-acetylene welding process with a neat sketch. **(08 Marks)**

OR

10 a. With a neat sketch explain magnetic particle inspection method and list its advantages. **(10 Marks)**

b. Explain Radiography inspection method with its advantages and disadvantages. **(10 Marks)**

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CBCS SCHEME

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Question Paper Version : A

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019

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(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 30

ಸೂಚನೆಗಳು

1. ಎಲ್ಲ ೩೦ ಪ್ರಶ್ನೆಗಳಿಗೂ ಉತ್ತರಿಸಿರಿ. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಒಂದು ಅಂಕ.
2. ಓ.ಎಂ.ಆರ್ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಯು.ಎಸ್.ಎನ್ ಸಂಖ್ಯೆ ಹಾಗೂ ಪಶ್ನೆ ಪತ್ರಿಕೆಯ ಶ್ರೇಣಿಯನ್ನು ಅಂದರೆ A, B, C ಅಥವಾ D ಯನ್ನು ತಪ್ಪಿಲ್ಲದಂತೆ ಕಡ್ಡಾಯವಾಗಿ ಗುರುತಿಸುವುದು ಅಭ್ಯರ್ಥಿಯ ಜವಾಬ್ದಾರಿಯಾಗಿರುತ್ತದೆ.
3. ಓ.ಎಂ.ಆರ್ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ನಿಗದಿಪಡಿಸಿರುವ ಸ್ಥಳದಲ್ಲಿ ಭರ್ತಿಮಾಡದೆ ಹಾಗೆಯೇ ಬಿಟ್ಟಲ್ಲಿ ಅಥವಾ ಭರ್ತಿಮಾಡಿದ ಮಾಹಿತಿಯಲ್ಲಿ ಯಾವುದೇ ವ್ಯತ್ಯಾಸವಿದ್ದಲ್ಲಿ ಅಂತಹ ಉತ್ತರ ಪತ್ರಿಕೆಗಳನ್ನು ರದ್ದು ಪಡಿಸಲಾಗುವುದು.
4. ಕೇವಲ ಒಂದು ಉತ್ತರವನ್ನು ಮಾತ್ರ ಉತ್ತರ ಪತ್ರಿಕೆಯಲ್ಲಿ ಗುರುತಿಸತಕ್ಕದ್ದು. ಒಂದೆ ಪ್ರಶ್ನೆಗೆ ಎರಡು ಉತ್ತರವನ್ನು ಗುರುತಿಸುವುದು ಅಮಾನ್ಯ.
5. ಎಲ್ಲಾ ಉತ್ತರಗಳನ್ನು ನಿಮಗೆ ಒದಗಿಸಲಾದ ಓ.ಎಂ.ಆರ್ ಉತ್ತರ ಪತ್ರಿಕೆಯ ಹಾಳೆಯ ಮೇಲೆ ಕಪ್ಪು ಅಥವಾ ನೀಲಿ ಶಾಹಿಯ ಬಾಲ್‌ಪಾಯಿಂಟ್ ಪೆನ್ನಿನಿಂದ ಗುರುತು ಮಾಡಬೇಕು.

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1. 'ಅಂಬಿಕಾತನಯದತ್ತ' ಕಾವ್ಯನಾಮದ ಕವಿ :
   ಅ) ದ.ರಾ. ಬೇಂದ್ರೆ ಬ) ಕೆ.ವಿ.ಪುಟ್ಟಪ್ಪ
   ಕ) ವಿ.ಕೃ.ಗೋಕಾಕ ಡ) ಗೋಪಾಲಕೃಷ್ಣ ಅಡಿಗ

2. ಕನ್ನಡಕ್ಕೆ ಸಂದಿರುವ ಜ್ಞಾನಪೀಠ ಪ್ರಶಸ್ತಿಗಳು :
   ಅ) ೧೦ ಬ) ೮
   ಕ) ೭ ಡ) ೯

3. 'ಶ್ರಾವಣ' ಕವನದಲ್ಲಿ ಕವಿ ಯಾವುದರ ಸೌಂದರ್ಯವನ್ನು ವರ್ಣಿಸಿದ್ದಾರೆ?
   ಅ) ಧಾರವಾಡದ ಬ) ಬೆಂಗಳೂರಿನ
   ಕ) ನಿಸರ್ಗದ ಡ) ಬೆಳಗಾವಿಯ

4. ಶ್ರೀ ವಿಶ್ವೇಶ್ವರಯ್ಯನವರು ಮೊದಲಬಾರಿ ಜೋಗ ಜಲಪಾತದ ಎದುರು ನಿಂತಾಗ ಹೇಳಿದ್ದು:
   ಅ) ಎಷ್ಟೊಂದು ಬೆಳೆ ಪೋಲಾಗುತ್ತಿದೆ
   ಬ) ಎಷ್ಟೊಂದು ಸಮಯ ಪೋಲಾಗುತ್ತಿದೆ
   ಕ) ಎಷ್ಟೊಂದು ಹಣ ಪೋಲಾಗುತ್ತಿದೆ
   ಡ) ಎಷ್ಟೊಂದು ಶಕ್ತಿ ಪೋಲಾಗುತ್ತಿದೆ

5. ಶ್ರೀ ಕುವೆಂಪುರವರ ಲೇಖನ ಯಾವ ಭಾಗದ ಚಿತ್ರಣವನ್ನು ನೀಡುತ್ತದೆ?
ಅ) ಮಲೆನಾಡು ಬ) ಕರಾವಳಿ
ಕ) ಮರುಭೂಮಿ ಡ) ದೊಡ್ಡನಗರ ಪ್ರದೇಶ

6. ಶ್ರೀ ವಿಶ್ವೇಶ್ವರಯ್ಯನವರ ಬಾಷಣಕ್ಕೆ ಯಾವುದು ಸರಿಹೊಂದುವುದಿಲ್ಲ?
ಅ) ಆಲೋಚನೆಯಲ್ಲಿ ಸತ್ಯನಿಷ್ಟೆ.
ಬ) ಹಾವಭಾವ-ಮಾತಿನ ಮಂಟಪದಲ್ಲಿ ಜನರನ್ನು ಮರಳುಮಾಡುವುದು.
ಕ) ಭಾಷಣದ ಕುರಿತು ತಯಾರಿ
ಡ) ಶೋತೃವರ್ಗಕ್ಕೆ ಗೌರವ

7. ಶ್ರೀ ಶಿವರಾಮ ಕಾರಂತರ "ದೋಣಿ ಹರಿಗೋಲುಗಳಲ್ಲಿ" ಲೇಖನ ಯಾವ ರೀತಿಯಾಗಿದೆ?
ಅ) ವಿಡಂಬನೆ ಬ) ನಾಟಕ
ಕ) ಪ್ರವಾಸ ಕಥನ ಡ) ತಂತ್ರಜ್ಞಾನ ಲೇಖನ

8. ಶ್ರೀ ವಿಶ್ವೇಶ್ವರಯ್ಯನವರ ವ್ಯಕ್ತಿತ್ವಕ್ಕೆ ಹೊಂದಿಕೊಳ್ಳುವಂತದ್ದು :
ಅ) ಶಿಸ್ತು ಬ) ಪಾಶ್ಚಾತ್ಯ ದಿರಿಸು
ಕ) ಹೊಣೆಗಾರಿಕೆ ಡ) ಮೇಲಿನ ಎಲ್ಲವು

9. 'ಸುಖ' ಪದಕ್ಕೆ ವಿರುದ್ಧಾರ್ಥಕ ಪದ :
ಅ) ದು:ಖ ಬ) ನಲಿವು
ಕ) ಸಂತೋಷ ಡ) ಒಲವು

10. 'ನಮ್ಮ ಎಮ್ಮೆಗೆ ಮಾತು ತಿಳಿಯುವುದೇ?' ಲೇಖನ ಯಾವ ರೀತಿಯಲ್ಲಿದೆ?
ಅ) ತಂತ್ರಜ್ಞಾನ ಲೇಖನ ಬ) ವಿನೋದ ಲೇಖನ
ಕ) ಪತ್ರಿಕಾ ಅಂಕಣ ಡ) ನಾಟಕ

11. ಶ್ರೀ ಪಿ.ಲಂಕೇಶ 'ಗುಬ್ಬಚ್ಚಿಗೂಡು' ಲೇಖನದಲ್ಲಿ ಚಿಂತಿಸಿರುವುದು :
ಅ) ಭಟ್ಟಂಗಿಗಳ ಬದುಕು ಬ) ದೀನತೆಯ ಬದುಕು
ಕ) ಸ್ವಂತಿಕೆಯ ಬದುಕು ಡ) ಅಸಮಾನತೆಯ ಬದುಕು

12. 'ಜನ' ಯಾವ ಲಿಂಗ
ಅ) ಸ್ತ್ರೀ ಲಿಂಗ ಬ) ಪುಲ್ಲಿಂಗ
ಕ) ಅಲಿಂಗ ಡ) ನಪುಂಸಕಲಿಂಗ

13. ಪತ್ರ ವ್ಯವಹಾರ - ಮನವಿಗಳಲ್ಲಿ ಇರಬೇಕಾದದ್ದು :
ಅ) ಸ್ಪಷ್ಟ ಮಾಹಿತಿ ಬ) ನೇರ ನಿರೂಪಣೆ
ಕ) ಸೌಜನ್ಯ ಡ) ಮೇಲಿನ ಎಲ್ಲವು

14. ಸಚಿವ + ಆಲಯ = ಸಚಿವಾಲಯ, ಇಲ್ಲಿರುವ ಸಂಧಿ :
ಅ) ಸುವರ್ಣ ಸಂಧಿ ಬ) ಸವರ್ಣ ಧೀರ್ಘ ಸಂಧಿ
ಕ) ರಾಜಯೋಗ ಸಂಧಿ ಡ) ವೃದ್ಧಿ ಸಂಧಿ

15. 'ವಿಶ್ವ ಮಾನವತೆ' ಎನನ್ನು ಪ್ರತಿಪಾದಿಸುತ್ತದೆ?
ಅ) ಕಂದಾಚಾರ ಬ) ಮೂಢನಂಬಿಕೆ
ಕ) ಸಾಮರಸ್ಯ–ಸಹಿಷ್ಣುತೆ ಡ) ಮತೀಯ ದ್ವೇಷ

16. 'ಪಡುವಣ' ಪದದ ವಿರುದ್ಧಾರ್ಥಕ ಪದ
ಅ) ಕೊಂಕಣ ಬ) ಬಡಗಣ
ಕ) ತೆಂಕಣ ಡ) ಮೂಡಣ

17. 'ನಾನು ನಿನ್ನೆ ಕೆ.ಜಿ.ಎಫಗೆ ಹೋಗಿದ್ದೆನು' ಈ ವಾಕ್ಯದಲ್ಲಿರುವ ಕಾಲ :
ಅ) ಭೂತ ಕಾಲ ಬ) ರಾಜಂಯೋಗ ಕಾಲ
ಕ) ಯಮಗಂಡ ಕಾಲ ಡ) ರಾಹು ಕಾಲ

18. 'ಫೋಟೊಗ್ರಾಫಿ' ಪದಕ್ಕೆ ಸಮನಾದ ಕನ್ನಡದ ಪದ:
ಅ) ವರ್ಣ ಚಿತ್ರ ಬ) ಛಾಯಾ ಚಿತ್ರ
ಕ) ತೈಲ ಚಿತ್ರ ಡ) ಚಲನ ಚಿತ್ರ

19. 'ಬೆಣ್ಣೆ ಹಚ್ಚು' ಪದದ ಸರಿಯಾದ ಅರ್ಥ:
ಅ) ರೊಟ್ಟಿಗೆ ಬೆಣ್ಣೆ ಹಚ್ಚು ಬ) ದೋಸೆಗೆ ಬೆಣ್ಣೆ ಹಚ್ಚು
ಕ) ಹೊಗಳುವುದು ಡ) ರಾಗಿಮುದ್ದೆಗೆ ಬೆಣ್ಣೆ

20. 'ಎಲ್ಲ ಹುಡಿಗಿಯರ ಕನಸು' ಕವನ ಯಾವುದರ ಕುರಿತಾಗಿದೆ?
ಅ) ಸಂಪ್ರದಾಯಗಳಿಗಿಂತಲು ಮಿಗಿಲಾಗಿರುವುದು ಮಹಿಳೆಯ ಘನತೆ.
ಬ) ಮಹಿಳಾ ಮೀಸಲಾತಿ
ಕ) ಸಮಾನತೆಗಾಗಿ ಚಳುವಳಿ
ಡ) ಕನಸಿನ ಮದುವೆ

21. ಶ್ರೀ 'ಬಂದೇ ನವಾಜ್' ಯಾರು?
ಅ) ಗುಲಬರ್ಗಾದ ಸೂಫಿ ಸಂತರು ಬ) ಬ್ರಿಟಿಶರಿಂದ ಉಂಬಳಿ ಪಡೆದವರು
ಕ) ವಜ್ರ ವ್ಯಾಪಾರಿಗಳು ಡ) ಗಣಿ ಧಣಿ

22. 'ರೆಹಮಾನರ ಹಾಡಿನ ಕಂಪೋಝಿಶನ ಚೆನ್ನಾಗಿದೆ' ಎನ್ನುವ ವಾಕ್ಯದಲ್ಲಿ ಕಂಪೋಝಿಶನ ಪದಕ್ಕೆ ಸರಿಯಾದ ಕನ್ನಡದ ಪದ:
ಅ) ಧ್ವನಿ ಸಂಪತ್ತು ಬ) ಸಂಯೋಜನೆ
ಕ) ನಿರ್ದೇಶನ ಡ) ಕಂಠದಾನ

23. 'ಆನೆಹಳ್ಳದಲ್ಲಿ ಹುಡುಗಿಯರು' ಲೇಖನದಲ್ಲಿ ವಿದ್ಯಾರ್ಥಿಗಳ ಪ್ರವಾಸದ ಉದ್ದೇಶ :
ಅ) ಆನೆ ದಂತ ಸಂಗ್ರಹಣೆ ಬ) ಖಡ್ಡಾಗಳ ಕುರಿತು ಅಧ್ಯಯನ
ಕ) ಸಸ್ಯ ವೀಕ್ಷಣೆ ಡ) ಹುಲಿ ವೀಕ್ಷಣೆ

24. ಡಾ॥ ಬೆಸಗರಹಳ್ಳಿ ರಾಮಣ್ಣನವರ 'ಗಾಂಧಿ' ಕಥೆ ಏನನ್ನು ಪ್ರತಿಪಾದಿಸುತ್ತದೆ?
ಅ) ವರ್ಣಾಶ್ರಮ ಪದ್ಧತಿ
ಬ) ಜಾತೀಯತೆ
ಕ) ಮುಢ ನಂಬಿಕೆ
ಡ) ಮಹಾತ್ಮ ಗಾಂಧೀಜಿಯವರ ಮೌಲ್ಯಗಳಿಗೆ ಒದಗಿರುವ ಅವಸ್ಥೆಯನ್ನು

25. ಶ್ರೀ ಸಿದ್ಧಲಿಂಗಯ್ಯನವರ 'ಬೆಲ್ಚಿಯ ಹಾಡು' ಕವನದಲ್ಲಿ ಕಂಡುಬರುವ ಅಂಶ :
ಅ) ಸಮಾಜದ ಸುಸ್ಥಿತಿ ಬ) ಪ್ರೇಮದ ರಮ್ಯತೆ
ಕ) ಭಕ್ತಿಯ ಪರವಶತೆ ಡ) ದಲಿತರ ಕನಸು

26. 'ಒಲೆಹತ್ತಿ ಉರಿದಡೆ ನಿಲಬಹುದಲ್ಲದೇ, ಧರೆಹತ್ತಿ ಉರಿದರೆ ನಿಲಬಾರದು, ಏರಿ ನೀರುಂಬಡೆ ಬೇಲಿ ಹೊಲದ ಮೇವ್ಹೊಡೆ, ನಾರಿ ತನ್ನ ಮನೆಯಲ್ಲಿ ಕಳುವ್ಹೊಡೆ, ತಾಯಿಯ ಮೊಲೆಹಾಲು ನಂಜಾಗಿ ಕೊಲವುಡೆ ಇನ್ನಾರಿಗೆ ದೂರುವೆ ಕೂಡಲ ಸಂಗಮದೇವಾ' ಈ ವಚನದ ರಚನೆಕಾರರು:
ಅ) ಸರ್ವಜ್ಞ ಬ) ಚಾಮರಸ
ಕ) ಅಲ್ಲಮಪ್ರಭು ಡ) ಬಸವಣ್ಣ

27. ಮಲೆಮಾದೇಶ್ವರ ಬೆಟ್ಟವಿರುವ ಸ್ಥಳ:
ಅ) ಅರಿಶಿನಕುಂಟೆ ಬ) ಅಥಣಿ
ಕ) ಅಫಜಲಪುರ ಡ) ಕೊಳ್ಳೆಗಾಲ

28. 'ಶ್ರೀ ಸಂಗೊಳ್ಳಿ ರಾಯಣ್ಣ' ಯಾರು?
ಅ) ಅದ್ಭುತ ಭಾಷಣಕಾರ ಬ) ವಂದಿಮಾಗಧರಿಗೆ ಸೇರಿದವನು
ಕ) ಬ್ಯಾಂಕಗಳಿಗೆ ಮೋಸ ಮಾಡಿದವನು ಡ) ಬ್ರಿಟಿಷರ ವಿರುದ್ಧ ಹೋರಾಡಿದ ಹೋರಾಟಗಾರ

29. ಮೊದಲು ಕನ್ನಡಕ್ಕೊಂದು ಅಪರೂಪ ನಿಘಂಟನ್ನು ರಚಿಸಿಕೊಟ್ಟವರು:
ಅ) ಪಂಪ ಬ) ಹರಿಹರ
ಕ) ಮೆಕಾಲೆ ಡ) ಕಿಟ್ಟೆಲ್

30. 'ಕನ್ನಡ ಸಂಸ್ಕೃತಿ' ಈ ರೀತಿಯಾಗಿದೆ :
ಅ) ಬಹುರೂಪಿಯಾಗಿದೆ ಬ) ವರ್ಣರಂಜಿತವಾಗಿದೆ
ಕ) ಜೀವಂತವಾಗಿದೆ ಡ) ಮೇಲಿನ ಎಲ್ಲವು

* * * * *

CBCS SCHEME

17KKK39

USN | | | | | | | | | | |

Question Paper Version : A

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Kannada Kali
(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 30

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the thirty questions, each question carries **ONE mark**.
2. Use only **Black ball point pen** for writing / darkening the circles.
3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**
4. Darkening two circles for the same question makes the answer invalid.
5. **Damaging/overwriting, use of whiteners** on the **OMR** sheets are strictly prohibited.

Note : Fill in the blank by translating the given English word to Kannada.
[From Question No : 1 to 5]

1. He : --------
   a) NAnu b) Neenu
   c) Avanu d) AvaLu

2. When : ----------
   a) Yaaru b) Yaavaga
   c) Yelli d) Yaake

3. Teacher : ----------
   a) HuDuga b) Manushya
   c) Shikshaka/ki d) Shishya

4. Vegetable : ----------
   a) tarakari b) takararu
   c) tavaruru d) tamota

5. Garden : ---------
   a) Mane b) Shaale
   c) TooTa d) Baagilu

Note : Substitute the words from the following each sentence in appropriate place
[From Q No. 6 to 8]

6. naanu uuTa maaDu
   a) maaDuttene b) maaDideya
   c) maaDisu d) maaDi

7. Namma manege baa ?
   a) Baruttiya
   b) Bandi
   c) BeDa
   d) Baru

8. Nanna hattira Kutka.
   a) KuLituko
   b) KooDu
   c) Kundru
   d) None.

Note : Write the English word for given Kannada word [From Q No. 9 to 12]

9. HaLe
   a) New
   b) Now
   c) Not
   d) Old

10. Kurci
   a) Table
   b) Book
   c) Chair
   d) Pen

11. GaNita
   a) Physics
   b) Biology
   c) Mathematics
   d) English

12. Shaale
   a) Home
   b) School
   c) Office
   d) Room.

Note : Fill in the blank choosing the right word from the group below :

13. nanage ninna sahavaasa khanDitaa ----------.
   a) BeDa
   b) Beka
   c) Ide
   d) Illa.

Note : Translate the following Kannada question into English.
[from question No. 14 to 15]

14. Niivu yaaru ?
   a) who is this?
   b) what is this?
   c) who are you?
   d) what is there?

15. Idu Enu?
   a) who is this?
   b) what is this?
   c) who are you?
   d) what is there?

Note : Translate the following English words to Kannada
[from Q No. 16 to 20]

16. Near
   a) Swalpa
   b) hattira
   c) heege
   d) hosa

17. Shop
   a) AngaDi
   b) dukan
   c) kante
   d) Mane.

18. See
a) NooDu
b) MaaDu
c) BiDu
d) IDu

19. Moon
a) candra
b) Suurya
c) Naksatra
d) Boomi

20. Child
a) Maanava
b) Magu
c) MahiLe
d) HeNNu

Note : Translate the Kannada word into English.
[From Q No. 21 to 30]

21. Meenu
a) Animal
b) Fish
c) Crow
d) Owl

22. Nayee
a) Pig
b) Cow
c) Dog
d) Cat

23. Aat
a) See
b) Come
c) Go
d) Play

24. Mana
a) Home
b) School
c) Pen
d) Mind

25. Nanu
a) I
b) You
c) We
d) He

26. Maga
a) Father
b) Sister
c) Daugher
d) Son.

27. Baa
a) Go
b) Sit
c) Visit
d) Come

28. Kaagad
a) Chair
b) Computer
c) Mouce
d) Paper

29. Avanu
a) He
b) She
c) It
d) They

30. Aangla
a) Kannada
b) English
c) Marathi
d) Urdu.

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CBCS SCHEME

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15MAT41

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Mathematics – IV

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Using Taylor's series method solve $\frac{dy}{dx} = x^2 + y^2$ with y(0) = 1 and hence find y(0.1) and consider upto 3rd degree. **(06 Marks)**

b. Using modified Euler's method solve $\frac{dy}{dx} = 1 + \frac{y}{x}$ with y(1) = 2 then find y(1.2) in two steps. **(05 Marks)**

c. Given $\frac{dy}{dx} = \frac{x+y}{2}$, give that y(0) = 2, y(0.5) = 2.636, y(1) = 3.595 and y(1.5) = 4.968 then find value of y at x = 2 using Milne's predictor and corrector formulae. **(05 Marks)**

OR

2 a. Using modified Euler's method solve $\frac{dy}{dx} = x + \sqrt{y}$, with y(0) = 1 then find y(0.2) with h = 0.2. **(06 Marks)**

b. Solve $\frac{dy}{dx} = \frac{y-x}{y+x}$, with y(0) = 1 and hence find y(0.1) by taking one steps using Runge-Kutta method of fourth order. **(05 Marks)**

c. Given $\frac{dy}{dx} = \frac{(1+x^2)y^2}{2}$, given that y(0) = 1, y(0.1) = 1.06. y(0.2) = 1.12 and y(0.3) = 1.21 then evaluate y(0.4) using Adam's – Bash forth method. **(05 Marks)**

Module-2

3 a. Given $\frac{d^2y}{dx^2} = \frac{2dy}{dx} - y$, y(0) = 1, y'(0) = 2, evaluate y(0.1) and y'(0.1) using Runge-Kutta method of fourth order. **(06 Marks)**

b. Solve the Bessel's differential equation : $x^2\frac{d^2y}{dx^2} + \frac{x\,dy}{dx} + (x^2 - n^2)y = 0$ leading to $J_n(x)$. **(05 Marks)**

c. Express $x^3 + 2x^2 - 4x + 5$ in terms of Legendre polynomials. **(05 Marks)**

OR

4 a. Using Milne's method. obtain an approximate solution at the point x = 0.8 of the problem $\frac{d^2y}{dx^2} = 1 - 2y\frac{dy}{dx}$ using the following data :

x	0	0.2	0.4	0.6
y	0	0.02	0.0795	0.1762
y′	0	0.1996	0.3937	0.5689

(06 Marks)

b. If α and β are two distinct roots of $J_n(x) = 0$ then P-T $\int_0^1 x\, J_n(\alpha x)\, J_n(\beta x)\, dx = \{0$ if $\alpha \neq \beta$.

(05 Marks)

c. With usual notation, prove that $J_{+\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$. **(05 Marks)**

Module-3

5 a. State and prove Cauchy-Riemann equation in Cartesian form. **(06 Marks)**

b. Find analytic function f(z) whose imaginary part is $v = \left(r - \frac{1}{r}\right)\sin\theta$. **(05 Marks)**

c. Discuss the transformation of $\omega = e^z$. **(05 Marks)**

OR

6 a. State and prove Cauchy's integral formula. **(06 Marks)**

b. Emulate $\oint_c \frac{e^{2z}}{(z+1)(z-2)} dz$ where c is |z| = 3 using Cauchy's residue theorem. **(05 Marks)**

c. Find the bilinear transformation which maps z = –1, 0, 1 into ω = 0, i, 3i. **(05 Marks)**

Module-4

7 a. Derive mean and variance of the binomial distribution. **(06 Marks)**

b. A random variable x has the following probability mass function.

x	0	1	2	3	4	5
P(x)	k	3k	5k	7k	9k	11k

i) find k ii) find p(x < 3) iii) find p(3 < x ≤ 5). **(05 Marks)**

c. The joint distribution of two random variable x and y as follows :

x \ y	–4	2	7
1	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$
5	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{8}$

Compute : i) E(x) and E(y) ii) E(xy) iii) cov(xy). **(05 Marks)**

OR

8 a. 2% of the fuses manufactured by a firm are found defective. Find the probability that a box containing 200 fuses contains. i) no defective fuses ii) 3 or more defective fuses. **(06 Marks)**

b. In a test on 2000 electric bulbs. It was found that the life of a particular brand was distributed normally with an average life of 2040 hours and S.D 60 hours. Estimate the number of bulbs likely to burn ($P(0 < z < 1.83) = 0.4664$ $P(1.33) = 0.4082$, $P(2) = 0.4772$) i) more than 2150 ii) less than 1960 iii) more than 1920 but less than 2160 hours. **(05 Marks)**

c. The joint probability distribution of two random variable X and Y given by the following table:

X \ Y	1	3	9
2	$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$
4	$\frac{1}{4}$	$\frac{1}{4}$	0
6	$\frac{1}{8}$	$\frac{1}{24}$	$\frac{1}{12}$

Find marginal distribution of X and Y and evaluate cov(XY).

(05 Marks)

Module-5

9 a. Define: i) Null hypothesis ii) significance level iii) Type–I and Type–II error. **(06 Marks)**

b. Ten individual are chosen at random from a population and their height in inches are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, 71. Test the hypothesis that mean height of the universe is 66 inches. Given that ($t_{0.05} = 2.262$ for 9d.f) **(05 Marks)**

c. Find the unique fixed probability vector for the regular stochastic matrix :

$$A = \begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}.$$

(05 Marks)

OR

10 a. A coin is tossed 1000 times and head turns up 540 times. Decide on the hypothesis that the coin is unbiased. **(06 Marks)**

b. Four coins are tossed 100 times and following results were obtained :

No. of heads	0	1	2	3	4
Frequency	5	29	36	25	5

Fit a binomial distribution for the data and test the goodness of fit $\left(\chi^2_{0.05} = 9.49\right)$. **(05 Marks)**

c. A student's study habit are as follows. If he studies one night, he is 70% sure not to study the next night. On the other hand if he does not study one night he is 60% sure not to study the next night. In the long run how often does he study? **(05 Marks)**

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CBCS SCHEME

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15MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

1 a. Find the rank of matrix $A=\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ **(05 Marks)**

b. Solve by Gauss elimination method:
$2x+y+4z=12 \qquad 4x+11y-z=33 \qquad 8x-3y+2z=20$ **(05 Marks)**

c. Find all the eigen values of the matrix
$A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$ **(06 Marks)**

OR

2 a. Find the values of K, such that the matrix A may have the rank equal to 3:
$A=\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 4 & K \\ 1 & 4 & 10 & K^2 \end{bmatrix}$ **(05 Marks)**

b. Solve by Gauss elimination method
$x_1-2x_2+3x_3=2 \qquad 3x_1-x_2+4x_3=4 \qquad 2x_1+x_2-2x_3=5$ **(05 Marks)**

c. Find all the eigen values and corresponding eigen vectors of the matrix
$A=\begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$ **(06 Marks)**

Module-2

3 a. Find C.F of $(4D^4-8D^3-7D^2+11D+6)y=0$. **(05 Marks)**

b. Solve the initial value problem $\frac{d^2x}{dt^2}+4\frac{dx}{dt}+29x=0$

Subject to the conditions $x(0)=0$, $\frac{dx}{dt}(0)=15$. **(05 Marks)**

c. Using the method of undetermined coefficients, solve $(D^2-4D+3)y=20\cos x$ **(06 Marks)**

OR

4 a. Solve $(D^2-2D+4)y=e^x\cos x$. **(05 Marks)**

b. Solve $(D^2+4)y=x^2+2^{-x}$. **(05 Marks)**

c. Using the method of variation of parameters, find the solution of $(D^2-2D+1)y=e^x/x$. **(06 Marks)**

Module-3

5 a. Find the Laplace transform of $\frac{\cos 3t - \cos 4t}{t}$. **(05 Marks)**

b. Find $L\{t\sin^2 t\}$ **(05 Marks)**

c. Express the following function interms of Heaviside unit step function and hence find the Laplace transform where

$$f(t) = \begin{cases} t^2 & 0 < t \le 2 \\ 4t & t > 2 \end{cases}$$ **(06 Marks)**

OR

6 a. Find $L\left[\frac{e^{-t}.\sin t}{t}\right]$. **(05 Marks)**

b. Using Laplace transform evaluate $\int_0^\infty e^{-t} t\sin^2 3t dt$. **(05 Marks)**

c. If $f(t) = \begin{cases} t & 0 \le t \le a \\ 2a - t & a \le t \le 2a \end{cases}$ $f(t+2a) = f(t)$, show that $L[f(t)] = \frac{1}{s^2}\tan h\left(\frac{as}{2}\right)$. **(06 Marks)**

Module-4

7 a. Find inverse Laplace transform of $\frac{s+5}{s^2 - 6s + 13}$. **(05 Marks)**

b. Find inverse Laplace transform of $\log\left[\frac{s^2+4}{s(s+4)(s-4)}\right]$. **(05 Marks)**

c. Solve by using Laplace transform method $y''(t) + 4y(t) = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(06 Marks)**

OR

8 a. Find $L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]$. **(05 Marks)**

b. Find $L^{-1}\left[\frac{(s+2)e^{-s}}{(s+1)^4}\right]$ **(05 Marks)**

c. Solve by using Laplace transform method $y'' + 5y' + 6y = 5e^{2x}$, $y(0) = 2$, $y'(0) = 1$. **(06 Marks)**

Module-5

9 a. There are 10 students of which three are graduates. If a committee of five is to be formed, what is the probability that there are (i) only 2 graduates (ii) atleast 2 graduates? **(05 Marks)**

b. In a school 25% of the students failed in the first language, 15% of the students failed in second language and 10% of the students failed in both. If a student is selected at random find the probability that :

i) He failed in first language if he had failed in the second language.

ii) He failed in second language if he had failed in the first language. **(05 Marks)**

c. In a bolt factory there are four machines A, B, C and D manufacturing respectively 20%, 15%, 25%, 40% of the total production. Out of these 5%, 4%, 3% and 2% are defective. If a bolt drawn at random was found defective what is the probability that it was manufactured by A or D. **(06 Marks)**

OR

10 a. From 6 positive and 8 negative numbers, 4 numbers are chosen at random (without replacement) and multiplied. What is the probability that the product is a positive number? **(05 Marks)**

b. Three students A, B, C write an entrance examination. Their chances of passing are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$ respectively. Find the probability that (i) atleast one of them passes (ii) all of them passes. **(05 Marks)**

c. Three major parties A, B, C are contending for power in the elections of a state and the chance of their winning the election is in the ratio 1:3:5. The parties A, B, C respectively have probability of banning the online lottery $\frac{2}{3}$, $\frac{1}{3}$, $\frac{3}{5}$. What is the probability that there will be a ban on the online lottery in the state? What is the probability that the ban is from the party 'C'? **(06 Marks)**

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CBCS SCHEME

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15ME32

Third Semester B.E. Degree Examination, July/August 2021
Material Science

Time: 3 hrs. Max. Marks: 80

Note : 1. ***Answer any FIVE full questions.***
2. ***Drat neat sketches, wherever required.***

1 a. Explain the FCC structure. From the basics find its APF. **(06 Marks)**
b. Differentiate between Edge and Screw dislocation. **(04 Marks)**
c. Sketch the Stress – Strain diagram for mild steel and mark the salient points. Explain the following properties i) Yield strength ii) Toughness. **(06 Marks)**

2 a. Differentiate between Ductile and Brittle fracture. **(05 Marks)**
b. With $\in$ - t diagram, explain the various stages of creep. **(06 Marks)**
c. Explain how SN diagrams are Plotted for a material. **(05 Marks)**

3 a. Explain the Hume – Ruthery rules governing for the formation of Substitional Solid Solutions. **(05 Marks)**
b. Construct a phase diagram, to the scale on graph sheet for the following details :
Melting point of silver (Ag) = 961^0C ; Melting point of Copper (Cu) = 1083^0C.
Eutectic temperature = 780^0C ; Eutectic composition = 28% Cu.
Maximum solubility of Cu in Ag = 9% at 780^0C.
Maximum solubility of Ag in Cu = 8% at 780^0C.
Maximum solubility of Cu in Ag = 2% at 400^0C.
Maximum solubility of Ag in Cu = 0% at 400^0C.
Label all the fields. Determine the following :
i) Solidification process for 20% Cu.
ii) Amount of Eutectic in 20% Cu – 80% Ag alloy at 700^0C.
iii) Percentage and composition of the liquid and solid phases in a 20% Ag and 80% Cu alloy at 900^0C. **(11 Marks)**

4 a. Sketch the Iron – Carbon equilibrium diagram labeling the different fields and write down the equations for Eutectic, Eutectoid and Peritectic reactions. **(10 Marks)**
b. What are Solid Solutions? List the various types of Solid solutions with sketch. **(06 Marks)**

5 a. Explain how TTT curves are plotted. **(06 Marks)**
b. Enumerate the complete classification of Heat treatment process. **(05 Marks)**
c. Differentiate between Annealing and Normalizing. **(05 Marks)**

6 a. Explain the Flame hardening process, with neat sketch. **(06 Marks)**
b. Explain the Composition , Properties and Microstructure of
i) Grey Cast Iron ii) SG Iron. **(06 Marks)**
c. Explain the Age hardening of Aluminum – Copper Alloys. **(04 Marks)**

7 a. Explain the following Mechanical properties of Ceramics :
i) Tensile strength ii) Hardness iii) Compressive strength iv) Modulus of elasticity. **(04 Marks)**

b. Enumerate the classification of Ceramic fabrication techniques. **(05 Marks)**
c. Explain with a neat sketch, the Compression Molding of Polymers. **(07 Marks)**

8 Explain the following :
a. Shape Memory alloys. **(06 Marks)**
b. Fiber Optic materials. **(05 Marks)**
c. Biological application of Smart Materials. **(05 Marks)**

9 a. What are Composites? Enumerate the complete classification of Composites, with sketches. **(08 Marks)**
b. Explain with neat sketch, the Hand lay up process. **(08 Marks)**

10 a. With a neat sketch, explain the Pultrusion process. **(06 Marks)**
b. Write a note on Hybrid Composites. **(05 Marks)**
c. Calculate modulus of elasticity and the tensile strength of the following Composite material stressed under isostrain conditions. The composite consists of a continuous glass – fiber – reinforced – epoxy resin produced by using 60% by volume of E – glass fibers having a modulus of elasticity of E_f = 72 GPa and a tensile strength of 2400 MPa and a hardened epoxy resin with a modulus of elasticity of E_m = 3GPa and tensile strength of 62MPa. **(05 Marks)**

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CBCS SCHEME

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15ME33

Third Semester B.E. Degree Examination, July/August 2021
Basic Thermodynamics

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions.***
2. ***Use of thermodynamic data hand book permitted.***

1 a. Define thermodynamics. Explain the macroscopic and microscopic approaches. **(03 Marks)**
b. Define (i) Open system (ii) Closed system (iii) Property. **(05 Marks)**
c. The temperature T on a scale is given by $T = a \ln x + b$, where a and b are constants and x is thermometric property. The values of x at ice and steam points are 1.83 and 6.78. The corresponding temperatures are assigned values 0 and 100 respectively. Determine temperature when $x = 2.42$. **(08 Marks)**

2 a. Define work according to thermodynamics. **(02 Marks)**
b. Derive expressions for the displacement work for polytropic process. **(06 Marks)**
c. Air is compressed from atmospheric pressure and 0.2 m^3 to 5 bar in a polytropic process with an index of compression of 1.4. Calculate the work needed for compression. Had the compression been carried out hyperbolically between the some initial state and the same final pressure, what would be the work needed? **(08 Marks)**

3 a. State the first law of thermodynamic for closed system. **(04 Marks)**
b. Prove that energy is a property of system. **(04 Marks)**
c. At the inlet of a nozzle, the enthalpy of working fluid is 3 MJ/kg and the velocity is 60 m/s, At the exit, the enthalpy is 2.76 MJ/kg. The nozzle is horizontal and is insulated. Calculate the velocity at the exit. If the diameter of inlet is 357 mm and density of working fluid at inlet is 5.35 kg/m^3, determine the mass flow rate. If the density of working fluid is 2 kg/m^3 at exit, determine the exit diameter. **(08 Marks)**

4 a. A Carnot engine has a rated output of 5 kW. The heat supplied is 6 kW. Calculate the efficiency and heat rejected. Also determine the source and sink temperatures, if the difference is 300°C. **(06 Marks)**
b. With the help of a schematic diagram, show that Kelvin-Planck and Clausius statements of second law of thermodynamics are equivalent. **(10 Marks)**

5 a. Define reversible and irreversible processes. What is the need to define a reversible process as it is not at all practical? **(03 Marks)**
b. Explain the factors that make a process irreversible. **(05 Marks)**
c. Prove the basic equation of absolute thermodynamic temperature scale $\frac{Q_1}{Q_2} = \frac{T_1}{T_2}$ for a reversible heat engine. **(08 Marks)**

6 a. Prove that entropy is indeed a property. **(03 Marks)**

b. 1.2 kg of nitrogen at 120 kPa, 300 K is compressed polytropically until the volume reduces by 50%. The index of compression is 1.3 and C_P = 1.04 kJ/kgK. Determine the entropy change during compression. **(08 Marks)**

c. Draw Carnot cycle on a T-S plot and show that the network is given by $(T_1 - T_2)\ \Delta S$. **(05 Marks)**

7 a. Air expands in a turbine from 500 kPa, 520°C to 100 kPa, 300°C. The heat loss to the surroundings is 10 kJ/kg, and surrounding is at 20°C. Determine available energy and irreversibility per kg of air. **(08 Marks)**

b. Derive Maxwell's relations. **(08 Marks)**

8 a. Draw representative P-T diagram for water and explain the regions. **(04 Marks)**

b. Steam initially at 150 bar, 500°C expands reversibly and adiabatically in a turbine to a pressure of 0.1 bar. If the steam flow rate is 600 tons per hour. Determine the work output of turbine. Use steam tables for the properties of steam. **(08 Marks)**

c. Steam flows in a pipe at 15 bar. After expanding to 1 bar in a throttling calorimeter, the temperature is found to be 110°C. Determine the quality of steam in the pipe using Mollier chart. **(04 Marks)**

9 a. A mixture of ideal gases consists of 79 kg Nitrogen and 21 kg oxygen at 1 bar. Calculate the (i) Partial pressures, (ii) Equivalent molecular weight of the mixture, and (iii) Equivalent gas constant of the mixture. **(09 Marks)**

b. Define (i) Specific humidity and (ii) Relative humidity. **(02 Marks)**

c. Atmospheric air at mean sea level and 30°C has a relative humidity of 80% using psychrometric chart, find (i) wet bulb temperature (ii) specific humidity and (iii) dew point temperature. **(05 Marks)**

10 a. What are the limitations of ideal gas equation? **(02 Marks)**

b. Estimate the pressure of 100 kg of Nitrogen, which occupies a volume of 0.375 m^3 at 175 K using (i) Ideal gas equation, and (ii) Vander Waal's equation. Take Vander Waal's constants a = 136.6 kN $m^4/kmol^2$ and b = 0.0386 $m^3/Kmol$. **(08 Marks)**

c. Determine the density of steam in a boiler at 406°C and 332 bar using generalized compressibility chart. **(06 Marks)**

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CBCS SCHEME

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15ME/MA34

Third Semester B.E. Degree Examination, July/August 2021
Mechanics of Materials

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions.

1 a. Explain in brief, the terms 'stress' and its types, and 'strain' and its types. **(06 Marks)**

b. For a laboratory tested specimen, the following data were obtained:
Diameter of the specimen = 25 mm
Length of the specimen = 300 mm
Extension of specimen under a load of 15 kN = 0.045 mm
Load at yield point = 127.65 kN
Maximum load = 208.6 kN
Length of specimen after failure = 375 mm
Neck diameter at failure = 17.75 mm
Determine: (i) Young's modulus (ii) Yield point stress (iii) Ultimate stress
(iv) Percentage elongation (v) Percentage reduction in area **(10 Marks)**

2 a. A uniformly tapering circular bar having smaller diameter d_1 and larger diameter d_2 at the two ends is subjected to a pull of P. If the length of the bar is 'L', find the total deformation in the bar. **(08 Marks)**

b. A stepped bar with varying cross sections is subjected to forces as shown in Fig.Q2(b) below:

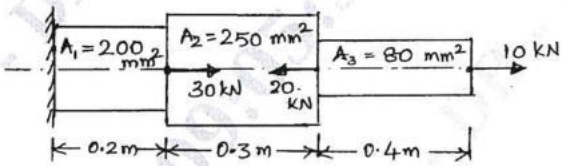

Fig.Q2(b)

Determine the net deformation in the bar if the Young's modulus of bar material is 2×10^5 N/mm^2. **(08 Marks)**

3 a. When a certain thin walled tube is subjected to internal pressure and torque, the stresses in the tube wall are (i) 120 MPa (tensile – x direction) , (ii) 60 MPa (tensile – y direction), (iii) complimentary shear stress of 90 MPa in the directions of (i) and (ii).
Find the normal and tangential stress on the two planes which are equally inclined to stresses in (i) and (ii). **(08 Marks)**

b. At a point in a bracket, the stresses on two mutually perpendicular planes are 35 MPa (tensile) and 15 MPa (tensile). The shear stress across these planes is 9 MPa. Find the magnitude and direction of the resultant stress on a plane making an angle of 40° with the plane of first stress. Find also, the normal and tangential stress on the plane. Use Mohr's circle method. **(08 Marks)**

4 a. A thin cylinder of diameter 'd', wall thickness 't' and length 'L' is subjected to an internal fluid pressure of 'p'. Find the equations for circumferential and longitudinal stresses induced in the cylinder material. Draw neat sketches wherever necessary. **(08 Marks)**

b. A pipe of 400 mm internal diameter and 100 mm wall thickness carries a fluid at a pressure of 80 MPa. Calculate the maximum and minimum hoop stresses across the section. Also, sketch the distribution of radial and hoop stresses across the thickness of the cylinder. **(08 Marks)**

5 a. What is a beam? With neat sketches, explain briefly the types of beams and the loads they carry. **(08 Marks)**

b. A cantilever beam 2m long carries a UDL of 1.5 kN/m over the entire span. It also carries a point load of 2 kN at a distance of 0.5 m from the free (right) end. Draw the SFD and BMD of the beam. **(08 Marks)**

6 a. Derive the differential equation of deflection (Euler-Bernoulli). List the assumptions made in the derivation. **(08 Marks)**

b. A uniform I - section beam is 5m long and carries a UDL of 83 kN/m on its entire span. The I - section is 100 mm wide and 150 mm deep. The thickness of flanges is 25 mm each and the web thickness is 12 mm. If the beam is simply supported, determine the bending stress in the beam. **(08 Marks)**

7 a. Derive torsion equation using suitable notations. Draw neat sketches wherever necessary. **(10 Marks)**

b. Determine the diameter of a steel shaft which will transmit 90 KW of power at 160 rpm. The maximum shear stress induced is 60 MPa. Find also the length of the shaft if the twist in the shaft must not exceed 1° over the entire length. Take G = 80 GPa. **(06 Marks)**

8 a. A column of length ℓ, having its moment of inertia as I and Young's modulus E carries a compressive load of P. If the column is hinged at both the ends, find the Euler's buckling load equation for the column. **(08 Marks)**

b. A 1.5 m long, circular C/S column of 50 mm diameter has one of its ends fixed in direction and position while the other end is free. Taking a factor of safety of 3, calculate the safe load the column can carry using:

(i) Rankine formula, with yield stress as 560 N/mm^2 and constant $\alpha = \frac{1}{1600}$.

(ii) Euler's formula, taking E = 1.2 × 10^5 N/mm^2. **(08 Marks)**

9 a. A stepped bar of 1 m length is subjected to an axial pull such that the maximum tensile stress is equal to 150 MPa. Calculate the strain energy stored in the bar if E = 200 GPa. [Refer Fig.Q9(a)]

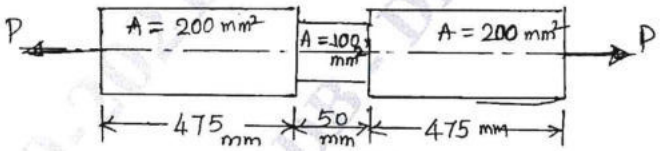

Fig.Q9(a) **(08 Marks)**

b. Find an expression for the strain energy due to bending of a beam of length 'L', simply supported at the ends and carrying a UDL of W/unit length over its entire length. The beam is of constant cross-section throughout its length having flexural rigidity as EI. **(08 Marks)**

10 a. In a metallic body, the principal stresses are +35 MPa and –95 MPa, the third principal stress being zero. The elastic limit stress in simple tension as well as in simple compression is equal and is 220 MPa. Find the factor of safety based on the elastic limit if the criterion of failure for the material is the maximum principal stress theory. **(08 Marks)**

b. A mild steel shaft 120 mm diameter is subjected to a maximum torque of 20 kN-m and a maximum bending moment of 12 kN-m at a particular section. Find the factor of safety according to maximum shear stress theory if the elastic limit in simple tension is 220 MN/m^2. **(08 Marks)**

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CBCS SCHEME

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17ME33

Third Semester B.E. Degree Examination, July/August 2021
Basic Thermodynamics

Time: 3 hrs. Max. Marks: 100

Note: 1. ***Answer any FIVE full questions.***
2. Use of thermodynamic data book is permitted.

1 a. Differentiate between open system and control volume. Give examples. **(06 Marks)**

b. With examples, define the following :
(i) Intensive property (ii) Extensive property
(iii) Path function (iv) Point function **(08 Marks)**

c. A constant volume gas thermometer containing a gas gives the reading of gas pressure of 1 bar and 1.5 bar at ice point and steam point respectively. Assuming $T = a + bP$, where P is in N/m^2, express the gas thermometer Celsius temperature T in terms of gas pressure. What is the temperature recorded by the thermometer when it registers a pressure of 1.2 bar. **(06 Marks)**

2 a. List out the similarities and dissimilarities between work and heat. **(06 Marks)**

b. Derive the work done expression for, (i) Isothermal process (ii) Isentropic process. **(06 Marks)**

c. A fluid is heated reversibly at a constant pressure of 1.013 bar until it has a specific volume of 0.1 m^3/kg. It is then compressed reversibly according to a law $PV = C$ to a pressure of 4.2 bar, then allowed to expand reversibly according to a law $PV^{1.3} = C$ to the initial conditions. The work done in the constant pressure process is 515 Nm and the mass of fluid present is 0.2 kg. Calculate the net work done on or by the fluid in the process. Sketch the cycle on P-V diagram. **(08 Marks)**

3 a. Describe Joule's experiment to verify First law of thermodynamics. **(06 Marks)**

b. Why PMMKI and PMMKII are impossible? **(06 Marks)**

c. A centrifugal pump delivers 50 kg of water per second. The inlet and outlet pressures are 1 bar and 4.2 bar. The suction is 2.2 m below the centre of the pump and delivery is 8.5 m above the centre of the pump. The suction and delivery pipe diameters are 20 cm and 10 cm respectively. Determine the capacity of the electric motor to run the pump if pump efficiency is 85%. **(08 Marks)**

4 a. Show that reversible heat engine has higher efficiency than irreversible heat engine. **(10 Marks)**

b. A refrigerator produces 2 tonnes of ice at 0°C per day from water maintained at 0°C. It rejects heat to atmosphere at 27°C. The power to the refrigerator is supplied by an engine which absorbs heat from a source, which is maintained at 227°C by burning fuel of calorific value 20×10^3 KJ/kg. Find the consumption of fuel per hour and the power developed by the engine. Assume both the devices to run on Carnot cycle. Take latent heat of ice as 335 KJ/kg. **(10 Marks)**

5 a. Clearly explain the factors that make a process irreversible. **(10 Marks)**

b. What is internal and external irreversibility? **(04 Marks)**

c. Show that entropy change is an irreversible process. **(06 Marks)**

6 a. State and prove Clausius inequality. **(08 Marks)**

b. The heat engine receives 300 kJ/min of heat from a source at 327°C and rejects heat to a sink at 27°C. Three hypothetical amounts of heat rejections are given below:

(i) 200 kJ/min, (ii) 150 kJ/min (iii) 100 kJ/min

Using entropy concept, state which of these cases is a reversible, irreversible or an impossible one. **(06 Marks)**

c. A perfect gas of mass 1.7 kg and volume 1.5 m^3/kg are compressed reversibly and polytropically from pressure 1 bar to 7.5 bar in a cylinder. The index of compression is 1.25, R = 0.540 kJ/kg K, $C_v = 1.687$ kJ/kgK. Calculate the work done, heat transfer and change in entropy. **(06 Marks)**

7 a. Define the following:

(i) Available and Unavailable energy.

(ii) Availability.

(iii) II law efficiency. **(06 Marks)**

b. Draw pressure-temperature diagram for a pure substance. Explain its salient features. **(07 Marks)**

c. 15 kg of water is heated in an insulated tank by a churning process from 300 K to 340 K. If the surrounding temperature is 300 K, find the loss in availability for the process. **(07 Marks)**

8 a. With a neat sketch, explain the working of Throttling calorimeter. What are its advantages and disadvantages? **(10 Marks)**

b. A certain quantity of steam in a closed vessel of fixed volume of 0.14 m^3 exerts pressure of 10 bar and 250°C. If the vessel is cooled so that the pressure falls to 3.6 bar, determine (i) final quality of steam (ii) final temperature (iii) change in internal energy (iv) heat transferred during the process. Take $C_p = 2.1$ kJ/kgK. **(10 Marks)**

9 a. State the following :

(i) Dalton's law of additive pressures.

(ii) Amagat's law of volume additives. **(04 Marks)**

b. Define the psychrometric properties given below:

(i) Wet bulb temperature

(ii) Dew point temperature.

(iii) Specific humidity

(iv) Relative humidity

(v) Degree of saturation

(vi) Dry bulb depression. **(09 Marks)**

c. A mixture of ideal gases consists of N_2 of 3 kg and CO_2 of 5 kg at a pressure of 300 KPa and temperature of 20°C. Find (i) Mole fraction of each constituent (ii) Gas constant of mixture (iii) Molecular weight of mixture (iv) Partial pressures and volumes. **(07 Marks)**

10 a. Write a note on : (i) Law of corresponding states (ii) Compressibility chart. **(06 Marks)**

b. With usual notations, write the Vander-Waal's equation of state. What is the significance of constants 'a' and 'b'. **(06 Marks)**

c. Determine the pressure in a steel vessel having a volume of 15 lit and containing 3.4 kg of N_2 at 400°C using,

(i) Ideal gas equation (ii) Vanderwaal's equation.

Also calculate the compressibility factor by using the answer obtained from the Vanderwaal's equation of state. **(08 Marks)**

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CBCS SCHEME

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17ME34

Third Semester B.E. Degree Examination, July/August 2021
Mechanics of Materials

Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Define the following:
(i) Elasticity (ii) Ductility (iii) Poison's ratio
(iv) Shear stress (v) Hooks law **(10 Marks)**

b. Derive an expression for the extension of a tapering bar whose diameter D_1 at one end tapers linearly to a diameter D_2 in a length L, under an-axial pull 'P' and Young's modulus E. **(06 Marks)**

c. A bar having cross-sectional area 300 mm^2 is subjected to axial forces as shown in Fig.Q1(c). Find the total elongation of the bar. Take E = 84 GPa.

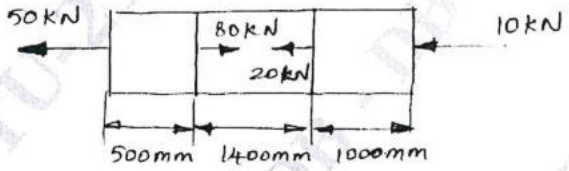

Fig.Q1(c) **(04 Marks)**

2 a. Derive a relation between Young's modulus and Modulus of rigidity. **(10 Marks)**

b. A copper bar of length 160 mm is placed on a rigid support in vertical position. Clearance between the upper support and top surface of the member is 0.1 mm as shown in the Fig.Q2(b). Determine:
(i) Increase in temperature required for the bar to touch the upper support.
(ii) Temperature rise required to induced compressive stress of 100 MPa.
(iii) Stress induced in the bar when its temperature is increased by 90°C and the upper support yields by 0.12 mm.
(iv) Stress induced in the bar when the temperature is increased by 30°C, assume that there is no clearance between upper support and top surface of the bar. Take E_c = 120 GPa and $\alpha_c = 18 \times 10^{-6}$/°C.

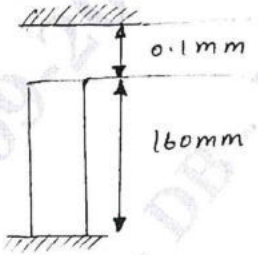

Fig.Q2(b) **(10 Marks)**

3 a. Derive an expression for normal stress and shear stress acting on a inclined plane. **(10 Marks)**

b. A point in a strained member is subjected to tensile stresses 100 MPa and 70 MPa along two mutually perpendicular directions. The point is also subjected to a shear stress 50 MPa such that shear force on vertical face give rise to anticlockwise couple. Determine:
(i) Stresses acting on a plane whose normal is at an angle of 120° with the reference to the 100 MPa stress plane.
(ii) Magnitude of principal stresses and maximum shear stresses
(iii) Orientations of the principal plane and maximum and minimum shear stress planes. Solve the problem using Mohr's circle method. **(10 Marks)**

4 a. Derive an expression for Hoop stress and longitudinal stress for thin cylinder. **(08 Marks)**

b. A thin cylindrical vessel of 1000 mm diameter and 3000 mm length has a metal wall of thickness 10 mm. It is subjected to an internal fluid pressure of 3 N/mm^2. Find the circumferential and longitudinal stresses in the wall. Determine the change in the length, diameter and volume of the cylinder. Assume E = 2.1 × 10^5 N/mm^2 and Poisson's ratio = 0.3. **(12 Marks)**

5 For the beam shown in the Fig.Q5, draw shear force and bending moment diagrams. Locate the point of contraflexure, if any.

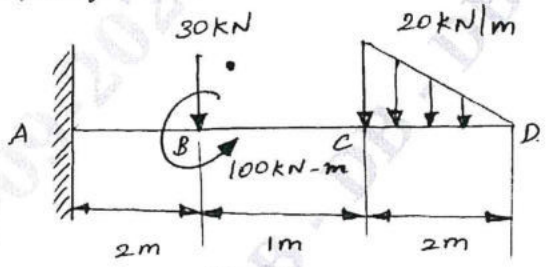

Fig.Q5 **(20 Marks)**

6 a. Derive the deflection equation, $EI\frac{d^2y}{dx^2} = M$. **(06 Marks)**

b. A T section of flange 120 × 12 mm and overall depth is 200 mm with 12 mm web thickness is loaded, such that, at a section it has a moment of 20 kN-m and shear force of 120 kN. Sketch the bending and shear force distribution diagram. **(14 Marks)**

7 a. Derive an expression for torque and shear stress of a shaft. **(08 Marks)**

b. A 2m long hollow cylinder shaft has 80 mm outer diameter and 10 mm wall thickness. When the torsional load on the shaft is 6 kN-m, determine:

(i) Maximum shear stress induced

(ii) Angle of twist

(iii) Also draw the distribution of shear stress in the wall of the shaft. Take G = 80 GPa. **(12 Marks)**

8 a. Derive a Euler's crippling load for a column when both of its ends are hinged. **(10 Marks)**

b. A 2m long column has a square cross-section of side 40 mm. Taking FOS = 4. Determine the safe load for the end conditions.

(i) Both ends are hinged

(ii) One end fixed and other end is free

(iii) Both ends are fixed.

Take E = 210 GPa. **(10 Marks)**

9 a. Derive an expression for strain energy due to shear stresses. **(10 Marks)**

b. Explain:

(i) Maximum principal stress theory

(ii) Maximum shear stress theory **(10 Marks)**

10 a. Derive an expression for the strain energy in bending and strain energy in torsion. **(16 Marks)**

b. A solid circular shaft is 4 m long has a diameter of 80 mm. Find the torsional strain energy stored in it when it is subjected to a torque of 200 N-m. Take G = 80 GPa. **(04 Marks)**

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CBCS SCHEME

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18ME32

Third Semester B.E. Degree Examination, July/August 2021
Mechanics of Materials

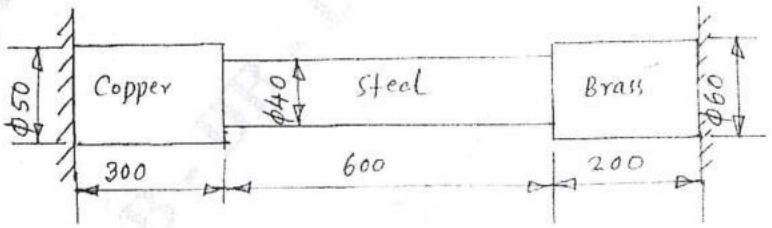
Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Define the terms : (i) Modulus of rigidity (ii) Factor of safety (iii) True stress (iv) Volumetric strain **(04 Marks)**

b. Deduce expression to determine the elongation of tapered rectangular bar of uniform thickness. **(06 Marks)**

c. A composite bar made of copper, steel and brass is rigidly attached to the end supports as shown in Fig. Q1 (c). Determine the stresses in the three portions of the bar when the temperature of the composite system is raised by 70°C, considering that the supports are rigid. Take $E_C = 100\,GPa$, $E_S = 205\,GPa$, $E_b = 95\,GPa$, $\alpha_C = 18\times10^{-6}/^\circ C$, $\alpha_S = 11\times10^{-6}/^\circ C$, $\alpha_b = 19\times10^{-6}/^\circ C$. **(10 Marks)**

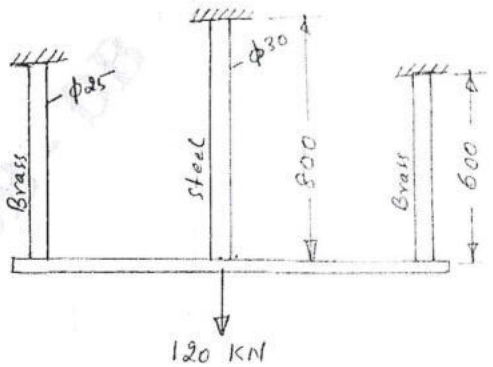


All dimensions are in mm

Fig. Q1 (c)

2 a. Define Bulk modulus. Derive a relationship between Young's modulus, modulus of rigidity and Poisson's ratio. **(10 Marks)**

b. Three equally spaced rods in the same vertical plane support a rigid bar AB. Two outer rods are of brass, each 600 mm long and of 25 mm in diameter. The central rod is of steel that is 800 mm long and 30 mm in diameter. Determine the forces in the rods due to an applied load of 120 kN through the mid point of the bar. The bar remains horizontal after the application of load. Take $\frac{E_S}{E_b} = 2$. The rigid bar system is shown in Fig. Q2 (b). **(10 Marks)**



Dimensions are in mm

Fig. Q2 (b)

3 a. Define Principal plane. Deduce expressions for stresses on an inclined plane in a body subjected to bi-axial stress condition. **(10 Marks)**

b. A thick cylinder has inner and outer diameters as 120 mm and 180 mm respectively. It is subjected to an external pressure of 9 MPa. Find the value of internal pressure which can be applied if the maximum stress is not to exceed 30 MPa. Draw the curves showing the variation of hoop and radial stresses through the material of the cylinder. **(10 Marks)**

4 a. What assumptions are taken in the analysis of thin cylinders? Deduce expressions for the circumferential and longitudinal stresses developed in thin cylinder. **(10 Marks)**

b. A plane element is subjected to stresses as shown in Fig. Q4 (b). Draw the Mohr's circle and determine principal stresses, maximum shear stress and their planes. **(10 Marks)**

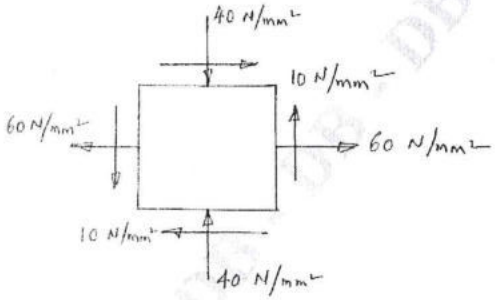


Fig. Q4 (b)

5 a. Draw the shear force and bending moment diagrams for a Cantilever subjected to forces as shown in Fig. Q5(a). **(10 Marks)**

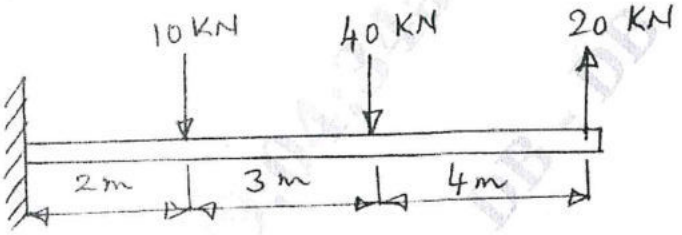


Fig. Q5 (a)

b. Prove the relation $\frac{\sigma_y}{y} = \frac{M}{I} = \frac{E}{R}$ for simple bending. **(10 Marks)**

6 a. A 10 m long simply supported beam is loaded as shown in Fig. Q6 (a). Draw the shear force and bending moment diagrams. **(10 Marks)**

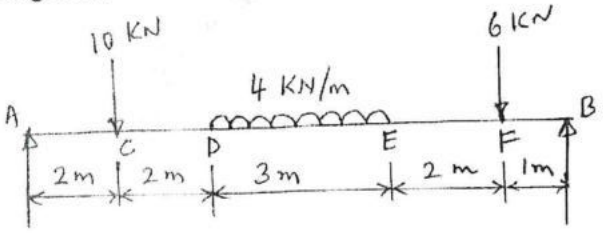


Fig. Q6 (a)

b. A 200 mm×80 mm I-beam is to be used as a simply supported beam of 6.75 m span. The web thickness is 6 mm and the flanges are of 10 mm thickness. Determine what concentrated load can be carried at a distance of 2.25 m from one support if the maximum permissible stress is 80 MPa. **(10 Marks)**

7 a. A bolt is acted upon by an axial pull of 16 kN along with a transverse shear force of 10 kN. Determine the diameter of the bolt required according to (i) Maximum principal stress theory (ii) Maximum shear stress theory. **(10 Marks)**

b. Deduce the torsion equation with usual notations, stating the assumptions made. **(10 Marks)**

8 a. A shaft transmits 280 kW of power at 160 rpm. Determine

(i) The diameter of solid shaft to transmit the required power.

(ii) The inner and outer diameters of a hollow circular shaft if the ratio of the inner to the outer diameter is $\frac{2}{3}$.

(iii) The percentage saving in the material on using a hollow shaft instead of a solid shaft.

Take the allowable stress as 80 MPa and the density of the material 78 kN/m^3. **(10 Marks)**

b. A thin walled 800 mm long member has the cross section as shown in Fig. Q8 (b). Determine

(i) The maximum torque if the angle carried by the section is limited to 4°.

(ii) The maximum shear stress induced for the maximum torque.

Take G = 82 GPa. **(10 Marks)**

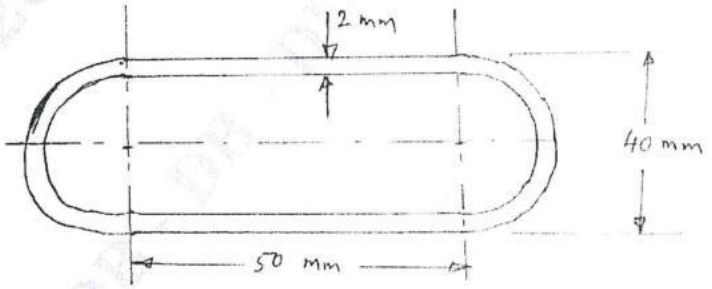


Fig. Q8 (b)

9 a. Derive an expression for Euler's critical load for a column with both ends hinged. **(10 Marks)**

b. A 4-m long hollow alloy tube with inside and outside diameters as 36 mm and 48 mm elongates by 3 mm under a tensile force of 50 kN. Determine the buckling load for the tube when it is used as a column with both ends pinned (hinged) and a factor of safety of 5. **(10 Marks)**

10 a. Derive an expression for strain energy for a member subjected to axial load. **(05 Marks)**

b. Explain Castigliano's theorem – I. **(05 Marks)**

c. Two elastic bars of equal length and of the same material : one is of circular cross section of 80 mm diameter and the other of square cross section of 80 mm side. Both absorb the same amount of strain energy under axial forces. Compare the stresses in the two bars. **(10 Marks)**

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CBCS SCHEME

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18ME32

Third Semester B.E. Degree Examination, July/August 2021
Mechanics of Materials

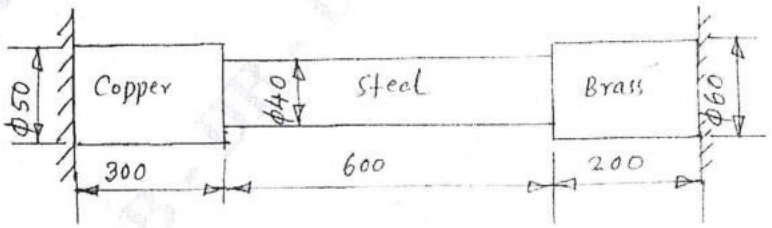
Time: 3 hrs. Max. Marks: 100

Note: Answer any FIVE full questions.

1 a. Define the terms : (i) Modulus of rigidity (ii) Factor of safety (iii) True stress (iv) Volumetric strain **(04 Marks)**

b. Deduce expression to determine the elongation of tapered rectangular bar of uniform thickness. **(06 Marks)**

c. A composite bar made of copper, steel and brass is rigidly attached to the end supports as shown in Fig. Q1 (c). Determine the stresses in the three portions of the bar when the temperature of the composite system is raised by 70°C, considering that the supports are rigid. Take $E_C = 100\,GPa$, $E_S = 205\,GPa$, $E_b = 95\,GPa$, $\alpha_C = 18\times10^{-6}/^\circ C$, $\alpha_S = 11\times10^{-6}/^\circ C$, $\alpha_b = 19\times10^{-6}/^\circ C$. **(10 Marks)**

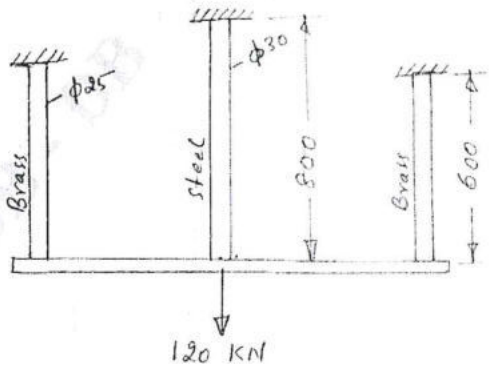


All dimensions are in mm

Fig. Q1 (c)

2 a. Define Bulk modulus. Derive a relationship between Young's modulus, modulus of rigidity and Poisson's ratio. **(10 Marks)**

b. Three equally spaced rods in the same vertical plane support a rigid bar AB. Two outer rods are of brass, each 600 mm long and of 25 mm in diameter. The central rod is of steel that is 800 mm long and 30 mm in diameter. Determine the forces in the rods due to an applied load of 120 kN through the mid point of the bar. The bar remains horizontal after the application of load. Take $\frac{E_S}{E_b} = 2$. The rigid bar system is shown in Fig. Q2 (b). **(10 Marks)**



Dimensions are in mm

Fig. Q2 (b)

3 a. Define Principal plane. Deduce expressions for stresses on an inclined plane in a body subjected to bi-axial stress condition. **(10 Marks)**

b. A thick cylinder has inner and outer diameters as 120 mm and 180 mm respectively. It is subjected to an external pressure of 9 MPa. Find the value of internal pressure which can be applied if the maximum stress is not to exceed 30 MPa. Draw the curves showing the variation of hoop and radial stresses through the material of the cylinder. **(10 Marks)**

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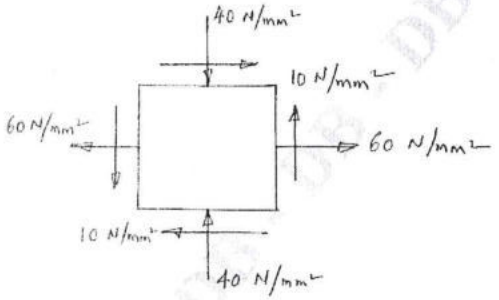

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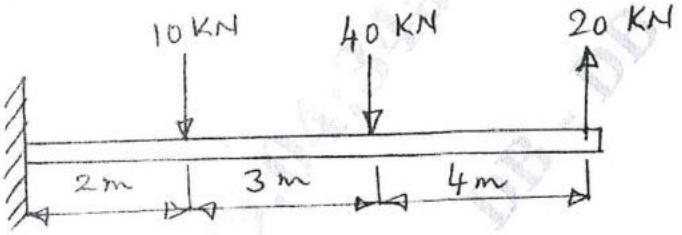

Fig. Q5 (a)

b. Prove the relation $\frac{\sigma_y}{y} = \frac{M}{I} = \frac{E}{R}$ for simple bending. **(10 Marks)**

6 a. A 10 m long simply supported beam is loaded as shown in Fig. Q6 (a). Draw the shear force and bending moment diagrams. **(10 Marks)**

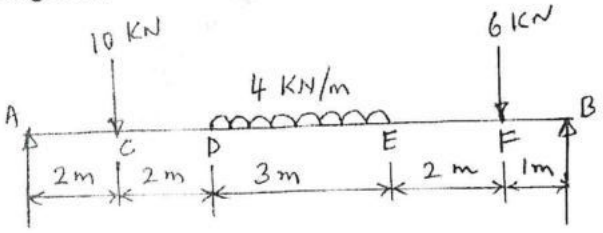

Fig. Q6 (a)

b. A 200 mm×80 mm I-beam is to be used as a simply supported beam of 6.75 m span. The web thickness is 6 mm and the flanges are of 10 mm thickness. Determine what concentrated load can be carried at a distance of 2.25 m from one support if the maximum permissible stress is 80 MPa. **(10 Marks)**

7 a. A bolt is acted upon by an axial pull of 16 kN along with a transverse shear force of 10 kN. Determine the diameter of the bolt required according to (i) Maximum principal stress theory (ii) Maximum shear stress theory. **(10 Marks)**

b. Deduce the torsion equation with usual notations, stating the assumptions made. **(10 Marks)**

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(ii) The inner and outer diameters of a hollow circular shaft if the ratio of the inner to the outer diameter is $\frac{2}{3}$.

(iii) The percentage saving in the material on using a hollow shaft instead of a solid shaft.

Take the allowable stress as 80 MPa and the density of the material 78 kN/m^3. **(10 Marks)**

b. A thin walled 800 mm long member has the cross section as shown in Fig. Q8 (b). Determine

(i) The maximum torque if the angle carried by the section is limited to 4°.

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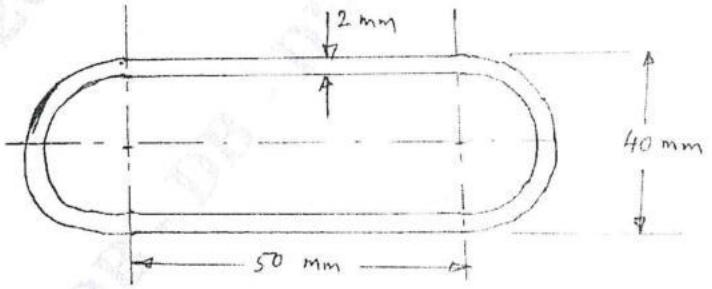

Fig. Q8 (b)

9 a. Derive an expression for Euler's critical load for a column with both ends hinged. **(10 Marks)**

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10 a. Derive an expression for strain energy for a member subjected to axial load. **(05 Marks)**

b. Explain Castigliano's theorem – I. **(05 Marks)**

c. Two elastic bars of equal length and of the same material : one is of circular cross section of 80 mm diameter and the other of square cross section of 80 mm side. Both absorb the same amount of strain energy under axial forces. Compare the stresses in the two bars. **(10 Marks)**

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CBCS SCHEME

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18ME33

Third Semester B.E. Degree Examination, July/August 2021
Basic Thermodynamics

Time: 3 hrs. Max. Marks: 100

Note : 1. ***Answer any FIVE full questions.***
2. ***Use of thermodynamic data handbook and steam table is permitted.***

1 a. Explain Mechanical , Chemical and Thermal equilibrium. **(06 Marks)**

b. With suitable examples, distinguish between : i) Open and closed system ii) Point and path function iii) Intensive and Extensive property. **(06 Marks)**

c. A constant volume gas thermometer, contain helium gives a reading of gas pressure 'P' of 1000 and 1366 mm of Hg at ice and steam point respectively. Assuming a linear relationship of form $T = a + bP$. Express the gas thermometer celicious temperature 'T' in terms of gas pressure 'P'. What is temperature recorded when thermometer reads 1074 mm of Hg. **(08 Marks)**

2 a. What do you understand by Microscopic and Macroscopic approach? **(06 Marks)**

b. Define i) State ii) Process iii) System iv) Quasistatic process. **(08 Marks)**

c. Define Zeroth law of thermodynamics and briefly explain its significance. **(06 Marks)**

3 a. Define Heat and Work in thermodynamics. Show that work is path function. **(08 Marks)**

b. Derive an expression for work done during an adiabatic process. **(06 Marks)**

c. A quasistatic process occurs such that $P = V^2 + \frac{8}{V}$, where 'P' is pressure in bar and V is volume in m^3. Find the work done when volume changes from $1m^3$ to $3m^3$. **(06 Marks)**

4 a. State the First law of thermodynamics applied to cyclic and non cyclic process. **(04 Marks)**

b. Derive Steady flow energy equation with Assumptions. **(06 Marks)**

c. Steam enters a turbine with a velocity of 320 m/s , Pressure 6 bar, Internal energy 2000 kJ/kg Specific volume of 0.36 m^3/kg and leaves at a velocity of 140 m/s , Pressure of 1.2 bar , Internal energy 1400 kJ/kg , Specific volume $1.3m^3$/kg. If the flow rate of fluid is 220kg/min and fluid rejects 100 kJ/s of heat. Determine the power developed in MW. The change in potential energy is neglected. **(10 Marks)**

5 a. Write two statements of Second law of thermodynamics and show their equivalence. **(10 Marks)**

b. A reversible engine 'A' operates between temperature limits T_1 and T_2 [$T_1 > T_2$]. The heat rejected by engine 'A' is received by another reversible engine 'B'. Engine 'B' rejects the heat to reservoir at temperature 'T_3' [$T_2 > T_3$].

Prove that i) $T_2 = \frac{T_1 + T_3}{2}$ for same work output ii) $T_2 = \sqrt{T_1 T_3}$ for same efficiency. **(10 Marks)**

6 a. Show that the entropy is a property of a system. **(06 Marks)**

b. State and prove Clausius inequality. **(06 Marks)**

c. 5 kg copper block at 200^0C is dipped to an insulated tank with 100kg of oil at 30^0C. Find the increase in entropy of the universe.
Take C_p [copper] = 0.4kJ/kg – K , C_p [oil] = 2.1 kJ/kg-K. **(08 Marks)**

7 a. What is Available and Unavailable energy? **(06 Marks)**

b. Write Maxwell relations and explain the terms involved. **(06 Marks)**

c. Derive Clausius Clayperon equation for evaporation of liquid and explain the significance. **(08 Marks)**

8 a. Define the following terms with reference to the pure substance : i) Latent heat ii) Sensible heat iii) Tripple point iv) Wet steam v) Dryness fraction. **(10 Marks)**

b. With neat sketch, explain the working of Separating Throttling Calorimeter. **(10 Marks)**

9 a. Explain the following :

i) Compressibility factor.

ii) Compressibility chart.

iii) Vander Waals equation of state.

iv) Law of corresponding states.

v) Gibbs Dalton's law. **(10 Marks)**

b. One K – mol of methane is stored in a $0.4m^3$ tank at 300K. Estimate the pressure of the gas using i) Ideal gas equation ii) Vander Waal's equation.
Vander Waal's constant $a = 228.5$ KPa $(m^3/K\text{-mol})^2$.
$b = 0.0427\ m^3/K\text{-mol}$. **(10 Marks)**

10 a. Derive Vander Waal's constants in terms of critical properties. **(08 Marks)**

b. A gaseous mixture has the following volumetric analysis. $O_2 = 30\%$, $CO_2 = 40\%$, $N_2 = 30\%$. Determine i) Analysis on mass basis.

ii) Molecular weight of mixture.

iii) Partial pressure of each component if total pressure is 100KPa and temperature is 32^0C. **(12 Marks)**

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CBCS SCHEME

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18ME34

Third Semester B.E. Degree Examination, July/August 2021
Material Science

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1 a. Define Atomic Packing Factor. Calculate APF for Face Cubic Centre (FCC) unit cell. **(08 Marks)**

b. Explain briefly points, line and surface defects, with neat sketches. **(12 Marks)**

2 a. With the help of stress – strain diagram, briefly explain the ductile and brittle behavior of Engineering Materials. **(10 Marks)**

b. Explain slip and twinning, with neat sketches. **(10 Marks)**

3 a. List different types of fatigue loading with examples. **(04 Marks)**

b. Explain with a neat sketch, the different stages of creep. **(08 Marks)**

c. What is meant by Stress Relaxation? Derive an expression for the stress relaxation. **(08 Marks)**

4 a. Construct and label the Iron – Carbon equilibrium diagram and explain briefly. **(10 Marks)**

b. What is Nucleation? Explain homogeneous nucleation in solidification. **(10 Marks)**

5 a. Explain the steps to construct TTT diagram. Draw a labeled sketch of TTT diagram for an eutectoid steel. **(10 Marks)**

b. Explain the following : i) Annealing ii) Normalizing. **(10 Marks)**

6 a. Explain the following : i) Pack carburizing ii) Flame hardening. **(10 Marks)**

b. Briefly explain Microstructure of Grey Cast Iron and SG Iron. Mention the composition , properties and applications of each. **(10 Marks)**

7 a. Explain the process of preparation of MMC using Melting and Casting method (Stir Casting method). **(10 Marks)**

b. Explain the following with neat sketches :
i) Hand layup process ii) Spray process. **(10 Marks)**

8 a. Explain with a neat sketch, the Sheet – Moulding Compound (SMC) process of producing composites. **(08 Marks)**

b. What are the Applications of Composites? **(04 Marks)**

c. Calculate the tensile modulus of elasticity of unidirectional Carbon – fiber reinforced Composite Material which contains 62% by volume of carbon fibers in Iso – strain and Iso – stress condition.
$E_{carbon\ fibers} = 3.86 \times 10^4$ kg/mm^2 and $E_{epoxy} = 4.28 \times 10^2$ kg/mm^2. **(08 Marks)**

9 a. Make use of different processing methods for the manufacturing of thermoplastics and explain the following : i) Hydrostatic extrusion ii) Slip casting. **(10 Marks)**

b. Explain the following with neat sketches : i) Calendering ii) Blow moulding. **(10 Marks)**

10 a. Write a note on Piezoelectric materials. **(06 Marks)**

b. List and explain the Biological applications of smart materials. **(06 Marks)**

c. Explain briefly few common NDT methods used for the testing of materials. **(08 Marks)**

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18ME35A/MEA305

Third Semester B.E. Degree Examination, July/August 2021
Metal Cutting and Forming

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1	a.	Sketch and explain Tool signature of Single point cutting tool.	**(07 Marks)**
	b.	Determine the Shear Plane angle of Single Point cutting tool.	**(10 Marks)**
	c.	What are the types of chips?	**(03 Marks)**
2	a.	Sketch and explain the parts of an Engine Lathe.	**(10 Marks)**
	b.	What are the Lathe Operations?	**(05 Marks)**
	c.	Differentiate between Engine Lathe and Capstan and Turret Lathe.	**(05 Marks)**
3	a.	Sketch and brief about the various Milling Operations.	**(10 Marks)**
	b.	What are the methods of Indexing?	**(05 Marks)**
	c.	Note the differences between drilling , boring and reaming operations.	**(05 Marks)**
4	a.	What are the differences between Shaper, Planar and Slotter?	**(08 Marks)**
	b.	Sketch and explain Surface Grinding machine.	**(12 Marks)**
5	a.	What are the effect of Process Parameters on tool life? Explain.	**(10 Marks)**
	b.	What are the functions of cutting fluids?	**(05 Marks)**
	c.	What are the effect of Machining Parameters on Surface finish.	**(05 Marks)**
6	a.	What is Machinability and Machinability Index? Explain.	**(08 Marks)**
	b.	The following equation for tool life is given for a turning operation ($VT^{(0.13)}.f^{(0.77)}.d^{(0.37)} = C$). A 60min tool life was obtained while cutting at V = 30m/min , f = 0.3mm/rev and depth of mt d = 25mm. Calculate the change in tool life, if the cutting speed , feed , depth of cut are increased by 25%, Individaully and also taken together. What will be their effect on tool life?	**(12 Marks)**
7	a.	Sketch and explain different forging equipments.	**(12 Marks)**
	b.	Write a note on different forging defects.	**(08 Marks)**
8	a.	Sketch and explain the types of Rolling Mills.	**(12 Marks)**
	b.	What are the variables in drawing process?	**(08 Marks)**
9	a.	Sketch and explain Sheet Metal Cutting Operation.	**(12 Marks)**
	b.	Brief out the different variables in drawing process.	**(08 Marks)**
10	a.	Explain : i) Drawing Ratio ii) Thickness Ratio iii) Drawing Force iv) Blank holding force v) Ironing.	**(10 Marks)**
	b.	Explain with neat sketches, Progressive and Combination dies.	**(10 Marks)**

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18ME35B/18MEB305

Third Semester B.E. Degree Examination, July/August 2021
Metal Casting and Welding

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions.***

1	a.	Explain in detail any four types of pattern allowances.	**(10 Marks)**
	b.	With neat sketches, explain investment moulding process.	**(10 Marks)**
2	a.	With neat sketches, explain shell moulding process.	**(10 Marks)**
	b.	Explain Open Riser and Blind Riser with neat sketches.	**(10 Marks)**
3	a.	With neat sketches, explain working principle of Cupola furnace.	**(12 Marks)**
	b.	With net sketches, explain working of Resistance Furnace.	**(08 Marks)**
4	a.	With neat sketches, explain the steps involved in slush casting process.	**(10 Marks)**
	b.	With net sketch, explain continuous casting process.	**(10 Marks)**
5	a.	Explain induction degassing and stream droplet degassing methods with neat sketches.	**(12 Marks)**
	b.	With neat sketches, explain any four casting defects.	**(08 Marks)**
6	a.	Describe the need of directional solidification in casting.	**(06 Marks)**
	b.	State the advantages and limitations of casting process.	**(08 Marks)**
	c.	With neat sketch, explain stir casting process.	**(06 Marks)**
7	a.	With neat sketch, explain metal inert gas welding process. Also state its advantages and limitation.	**(10 Marks)**
	b.	With neat sketch, explain electron beam welding process, also state its advantages.	**(10 Marks)**
8	a.	State the advantages and limitations of welding processes.	**(06 Marks)**
	b.	With neat sketch, explain hydrogen welding process.	**(08 Marks)**
	c.	With neat sketch, explain explosive welding process.	**(06 Marks)**
9	a.	Explain the different zones in welding with neat sketch.	**(06 Marks)**
	b.	Differentiate between brazing and soldering.	**(08 Marks)**
	c.	With neat sketch, explain ultrasonic inspection method.	**(06 Marks)**
10	a.	With neat sketches, explain any five welding defects.	**(10 Marks)**
	b.	With neat sketches, explain the types of flames that can be obtained during oxy-acetylene welding process.	**(10 Marks)**

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18ME36A/18MEA306/18MA36/18ME46A

Third/Fourth Semester B.E. Degree Examination, July/August 2021

COMPUTER AIDED MACHINE DRAWING

Time: 3 Hours Max. Marks: 100

Note: 1. Answer any ONE question from each of the parts A, B and C.
2. Use **First angle** projections only.
3. If any data is missing it may be suitably assumed and mentioned.
4. All the calculations should be on the answer sheet supplied.
5. All the dimensions are in mm.
6. Drawing instruments may or may not be used for sketching.
7. Part C assembly view should be in 3-D and other views in 2-D.

Part – A

1. Draw two views of square headed bolt of size 25 mm diameter and 100 mm long. Indicate all the dimensions. **25 Marks**

2. Draw the following profiles.
a) BSW thread and (b) Sellers thread of pitch 50 mm both **25 Marks**

Part – B

3. Draw the following view of a Knuckle joint used to joining two rods of diameter 20 mm (a) Sectional front view (b) side view. **25 Marks**

4. Draw sectional front view and side view of Oldham's coupling to connect two rods of diameter 25 mm, indicate all dimensions. **25 Marks**

Part – C

5. Figure 1 shows the details of a Plummer block. Assemble the parts of the Plummer block and show the following views.
   a. Half sectional front view showing the right half in section.
   b. Top view. **50 Marks**

6. Figure 2 shows the part drawing of a tail stock. Assemble the tail stock and show the following views.
   a. Sectional front view showing the top spindle portion in section.
   b. Left profile view. **50 Marks**

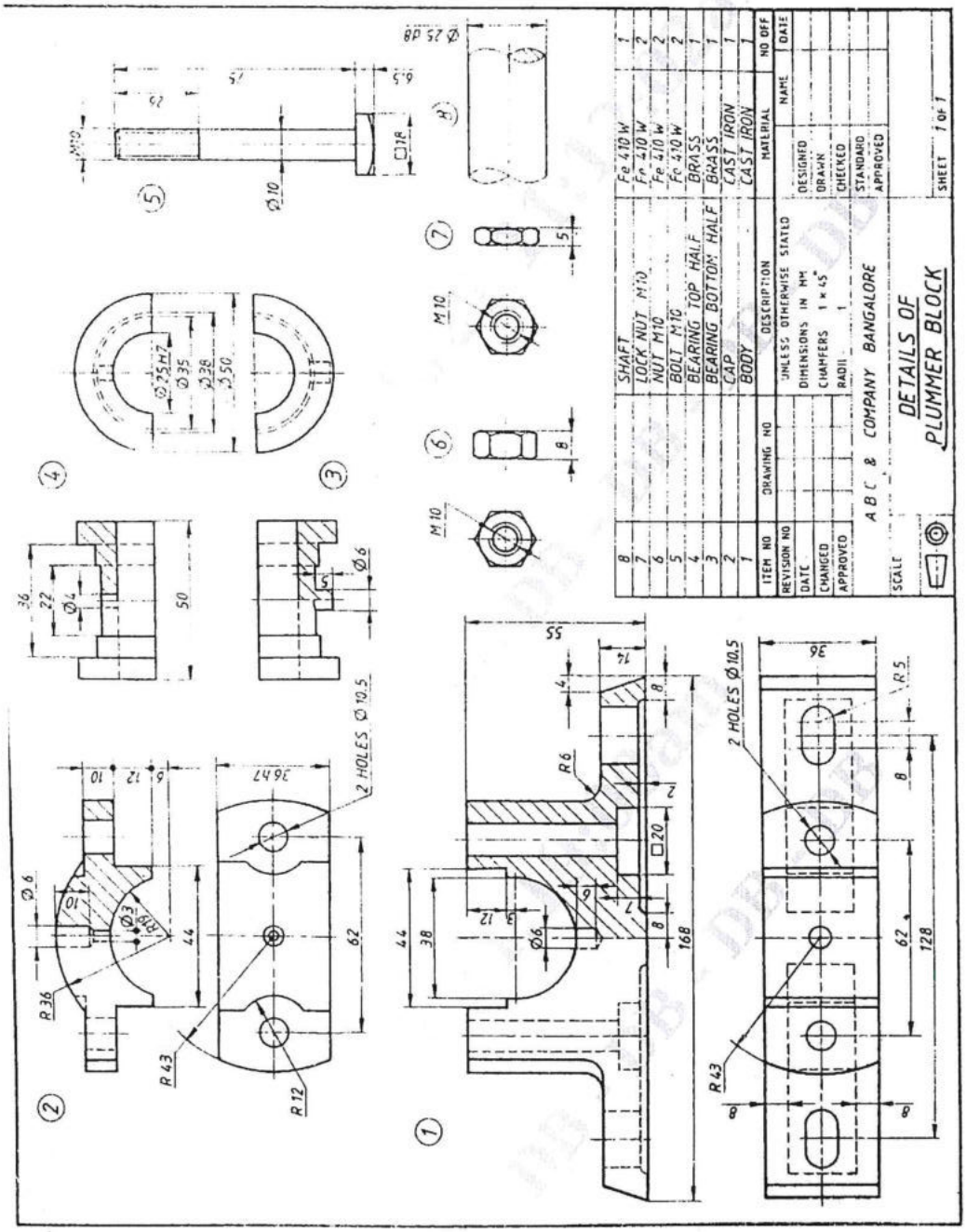

Figure 1: Details of Plummer block.

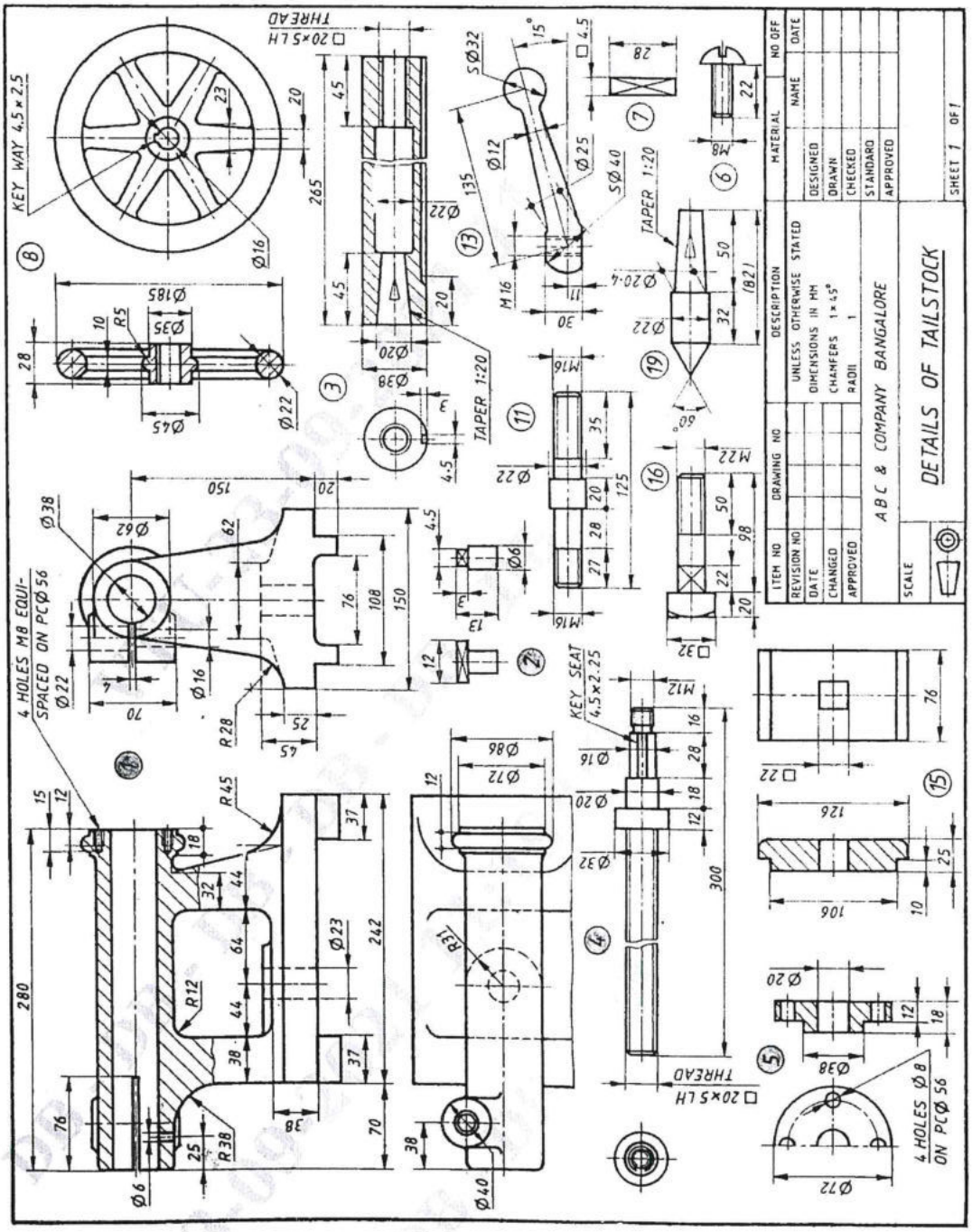

Figure 2: Details of tailstock.