CBCS SCHEME

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17MAT31

Third Semester B.E. Degree Examination, Aug./Sept. 2020
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 to represent the periodic function $f(x) = x - x^2$ from $x = -\pi$ to $x = \pi$. **(08 Marks)**

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

t sec	0	$\frac{T}{6}$	$\frac{T}{3}$	$\frac{T}{2}$	$\frac{2T}{3}$	$\frac{5T}{6}$	T
A amp.	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

Expand A as a Fourier series upto first harmonic. Obtain the amplitude of the first harmonic. **(06 Marks)**

c. Find the half range cosine series for the function $f(x) = (x-1)^2$ in $0 < x < 1$. **(06 Marks)**

OR

2 a. Find the Fourier series of $f(x) = 2x - x^2$ in (0, 3). **(08 Marks)**

b. Obtain the constant term and the coefficients of the first sine and cosine terms in the Fourier series expansion of y as given in the following table: **(06 Marks)**

x:	0	1	2	3	4	5	6
y:	9	18	24	28	26	20	9

c. Obtain the half-range sine series for the function,

$$f(x) = \begin{cases} x, & 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}.$$ **(06 Marks)**

Module-2

3 a. Find the Fourier transform of $f(x) = \begin{cases} a^2 - x^2, & |x| \le a \\ 0, & |x| > a \end{cases}$. Hence deduce that $\int_0^\infty \frac{(\sin x - x\cos x)}{x^3}\cos\frac{x}{2}dx = \frac{3\pi}{16}$. **(08 Marks)**

b. Find the Z-transform of,
(i) $\cos n\theta$ and (ii) $\cosh n\theta$ **(06 Marks)**

c. Solve $y_{n+2} + 6y_{n+1} + 9y_n = 2^n$ with $y_0 = 0 = y_1$, using z-transforms technique. **(06 Marks)**

OR

4 a. Find the Fourier cosine transform of e^{-ax}. Hence evaluate $\int_0^\infty \frac{\cos\lambda x}{x^2+a^2}dx$ **(08 Marks)**

b. Find the Z-transform of,
(i) $(n+1)^2$ (ii) $\sin(3n+5)$ **(06 Marks)**

c. Find the inverse Z-transform of $\frac{2z^2+3z}{(z+2)(z-4)}$. **(06 Marks)**

Module-3

5 a. Find the two regression lines and hence the correlation coefficient between x and y from the data. **(08 Marks)**

x	1	2	3	4	5	6	7	8	9	10
y	10	12	16	28	28	36	41	49	40	50

b. Fit a second degree parabola to the following data: **(06 Marks)**

x	0	1	2	3	4
y	1	1.8	1.3	2.5	6.3

c. Using Newton-Raphson method find the root of $x\sin x+\cos x=0$ near $x=\pi$ corrected to 4 decimal places. **(06 Marks)**

OR

6 a. Two variables x and y have the regression lines $3x+2y=26$ and $6x+y=31$. Find the mean values of x and y and the correlation coefficient between them. **(08 Marks)**

b. Fit a curve of the form, $y=ae^{bx}$ to the following data: **(06 Marks)**

x:	5	15	20	30	35	40
y:	10	14	25	40	50	62

c. Using Regula-Falsi method find the root of $xe^x=\cos x$ in the interval (0, 1) carrying out four iterations. **(06 Marks)**

Module-4

7 a. Using Newton's forward and backward interpolation formulae, find f(1) and (10) from the following table: **(08 Marks)**

x	3	4	5	6	7	8	9
f(x)	4.8	8.4	14.5	23.6	36.2	52.8	73.9

b. Given that $f(5)=150$, $f(7)=392$, $f(11)=1452$, $f(13)=2366$, $f(17)=5202$. Using Newton's divided difference formulae find f(9). **(06 Marks)**

c. Using Simpson's $\frac{1}{3}^{rd}$ rule evaluate $\int_0^{0.6} e^{-x^2}dx$ by taking seven ordinates. **(06 Marks)**

OR

8 a. Using Newton's Backward difference interpolation formula find f(105) from, **(08 Marks)**

x	80	85	90	95	100
f(x)	5026	5674	6362	7088	7854

b. If $f(1)=-3$, $f(3)=9$, $f(4)=30$, $f(6)=132$ find Lagrange's interpolation polynomial that takes the same value as f(x) at the given point. **(06 Marks)**

c. Evaluate $\int_4^{5.2} \log_e x\,dx$ by Simpson's $\frac{3}{8}^{th}$ rule with h = 0.1. **(06 Marks)**

Module-5

9 a. Verify Green's theorem for $\oint_C (xy + y^2)dx + x^2 dy$ where C is bounded by $y = x$ and $y = x^2$. **(08 Marks)**

b. Using Gauss divergence theorem evaluate $\iint_S \vec{F} \cdot \hat{n}\, ds$,

where $\vec{F} = (x^2 - yz)\hat{i} + (y^2 - zx)\hat{j} + (z^2 - xy)\hat{k}$ over the rectangular parallel piped $0 \le x \le a$, $0 \le y \le b$ and $0 \le z \le c$. **(06 Marks)**

c. With usual notations derive Euler's equation, $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(06 Marks)**

OR

10 a. If $\vec{F} = (5xy - 6x^2)\hat{i} + (2y - 4x)\hat{i}$, evaluate $\oint_C \vec{F}.d\vec{r}$ along the curve C in the xy-plane, $y = x^3$ from (1, 1) to (2, 8). **(08 Marks)**

b. Find the extremals of the functional with y(0) = 0 and y(1) = 1. **(06 Marks)**

c. Show that Geodesics on a plane arc straight lines. **(06 Marks)**

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17MATDIP31

Third Semester B.E. Degree Examination, Aug./Sept. 2020
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. Find the modulus and amplitude of, $1+\cos\alpha+i\sin\alpha$ **(06 Marks)**

b. Express the complex number $\frac{(1+i)(2+i)}{(3+i)}$ in the form a + ib. **(07 Marks)**

c. Find a unit vector normal to both the vectors $4i-j+3k$ and $-2i+j-2k$. Find also the sine of the angle between them. **(07 Marks)**

OR

2 a. Show that $\left[\frac{1+\sin\theta+i\cos\theta}{1+\sin\theta-i\cos\theta}\right]^n = \cos n\left(\frac{\pi}{2}-\theta\right)+i\sin n\left(\frac{\pi}{2}-\theta\right)$. **(06 Marks)**

b. If $\vec{A}=i-2j-3k$, $\vec{B}=2i+j-k$, $\vec{C}=i+3j-k$

find (i) $\left(\vec{A}\times\vec{B}\right)\times\left(\vec{B}\times\vec{C}\right)$ (ii) $\vec{A}\times\left(\vec{B}\times\vec{C}\right)$ **(07 Marks)**

c. Show that $\left[\vec{a}\times\vec{b},\ \vec{b}\times\vec{c},\ \vec{c}\times\vec{a}\right]=\left[\vec{a},\vec{b},\vec{c}\right]^2$. **(07 Marks)**

Module-2

3 a. If $y=(x^2-1)^n$ then prove that $(1-x^2)y_{n+2}-2xy_{n+1}+n(n+1)y_n=0$. **(06 Marks)**

b. Find the pedal equation of the curve $r^m=a^m(\cos m\theta+\sin m\theta)$. **(07 Marks)**

c. Show that the following curves intersect orthogonally $r=a(1+\cos\theta)$, $r=b(1-\cos\theta)$. **(07 Marks)**

OR

4 a. Show that $\sqrt{1+\sin 2x}=1+x-\frac{x^2}{2}-\frac{x^3}{6}+\frac{x^4}{24}$..... using Maclaurin's series expansion. **(06 Marks)**

b. If $u=e^{ax+by}f(ax-by)$, prove that $b\frac{\partial u}{\partial x}+a\frac{\partial u}{\partial y}=2abu$. **(07 Marks)**

c. Find $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ where $u=x^2+y^2+z^2$, $v=xy+yz+zx$, $w=x+y+z$. **(07 Marks)**

Module-3

5 a. Obtain a reducation formula for $\int\cos^n x\,dx$. **(06 Marks)**

b. Evaluate $\int_0^2\frac{x^4}{\sqrt{4-x^2}}dx$. **(07 Marks)**

c. Evaluate $\int_0^a\int_0^x\int_0^{x+y}e^{x+y+z}\,dz\,dy\,dx$. **(07 Marks)**

OR

6 a. Obtain a reducation formula for $\int \sin^n x \, dx$. **(06 Marks)**

b. Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3 y \, dx dy$. **(07 Marks)**

c. Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} (x^2 + y^2 + z^2) dz dy dx$. **(07 Marks)**

Module-4

7 a. A particle moves along the curve $x = 1 - t^3$, $y = 1 + t^2$ and $z = 2t - 5$.
(i) Determine its velocity and acceleration.
(ii) Find the components of velocity and acceleration at t = 1 in the direction $2i + j + 2k$. **(06 Marks)**

b. Find the directional derivative of, $\phi = x^2yz + 4xz^2$ at (1, -2, -1) along $2i - j - 2k$. **(07 Marks)**

c. If $\vec{F} = (x + y + az)i + (bx + 2y - z)j + (x + cy + 2z)k$ find a, b, c such that $\text{curl}\,\vec{F} = 0$ and then find ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

OR

8 a. If $\vec{r} = xi + yj + zk$ and $r = |\vec{r}|$ prove that $\nabla(r^n) = nr^{n-2}.\vec{r}$ **(06 Marks)**

b. If $\vec{F} = (x + y + 1)i + j - (x + y)k$ show that $\vec{F}.\text{curl}\,\vec{F} = 0$. **(07 Marks)**

c. Show that $\vec{F} = (y + z)i + (z + x)j + (x + y)k$ is irrotational. Also find a scalar function ϕ such that $\vec{F} = \nabla\phi$. **(07 Marks)**

Module-5

9 a. Solve : $\frac{dy}{dx} = \frac{y - x}{y + x}$. **(06 Marks)**

b. Solve : $(y^3 - 3x^2y)dx - (x^3 - 3xy^2)dy = 0$. **(07 Marks)**

c. Solve : $xy(1 + xy^2)\frac{dy}{dx} = 1$. **(07 Marks)**

OR

10 a. Solve : $\frac{dy}{dx} + y\cot x = \cos x$. **(06 Marks)**

b. Solve : $(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$. **(07 Marks)**

c. Solve : $\frac{dy}{dx} = \frac{x + 2y - 3}{2x + y - 3}$. **(07 Marks)**

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17ME32

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Calculate APF for HCP cell. (07 Marks)
b. Explain different types of surface imperfections, with sketch. (07 Marks)
c. Explain briefly the mechanical properties of a material in plastic range. (06 Marks)

OR

2 a. With sketch, explain cup and cone fracture. (07 Marks)
b. With sketch, discuss the different types of stress cycles which bring about fatigue fracture (07 Marks)
c. With SN diagram, explain fatigue behavior of different materials. (06 Marks)

Module-2

3 a. Explain different types of solid solutions, with sketches. (06 Marks)
b. Explain Hume Rothery rules for formation of solid solution. (05 Marks)
c. Two metals A and B have their melting points at 900^0C and 800^0C respectively. The alloy pair forms a eutectic at 600^0C of composition 60% B and 40% A. A and B have unlimited mutual liquid solubilities. Their solid solutions are as follows :
10% B in A at 600^0C and 5% B in A at 0^0C. ; 8% A in B at 600^0C and 4% A in B at 0^0C.
Assume liquidus , Solidus and Slovns lines to be straight. No solid state reactions or any intermediary phase changes occur in the series.
i) Draw the phase diagram for the series and label all salient temperatures, composition and regions.
ii) Find the room temperature structure of an alloy of composition 60% A and 40% B with respect to the number, type, extent and composition of the phases. (09 Marks)

OR

4 a. Draw Fe – Fe_3 C diagram. Label all phases, temperatures. Explain solidification process for any one alloy. (12 Marks)
b. Briefly explain three invariant reactions occur in the Fe – C phase diagram at different temperature and carbon concentration. (08 Marks)

Module-3

5 a. Draw T – T – T diagram for eutectoid steel and explain. (08 Marks)
b. Distinguish between Austempering and Martempering. (06 Marks)
c. Differentiate clearly between Normalising and Annealing. (06 Marks)

OR

6 a. With sketch, explain Jominy end quench test. (07 Marks)
b. Explain composition, properties and uses of gray cast iron and white cast iron. (07 Marks)
c. What is age hardening of Aℓ - Cu alloys? (06 Marks)

Module-4

7 a. Write a note on Injection Moulding process. **(07 Marks)**

b. What are Ceramics? Briefly explain the types of ceramics. **(07 Marks)**

c. Define Smart materials and explain biological applications of SMA. **(06 Marks)**

OR

8 a. How polymers are classified? What are the characteristics of polymers? **(07 Marks)**

b. Classify ceramic materials. Explain processing method of any one class. **(07 Marks)**

c. Explain Shape memory alloys and their applications. **(06 Marks)**

Module-5

9 a. Classify the composite based on matrix and reinforcement. List the roles of matrix , reinforcement and interface. **(07 Marks)**

b. With flow chart, explain the product of carbon fibres. **(07 Marks)**

c. Explain Resin Transfer Moulding process with sketch. **(06 Marks)**

OR

10 a. List the advantages and applications of composite material. **(07 Marks)**

b. Compare MMC and PMC. **(07 Marks)**

c. A composite material is made by using 10% by volume of Kevlar fibre and 90% epoxy matrix. If elastic modulus of Kevlar is 130 GN/m^2 and epoxy is $4GN/m^2$, calculate the

i) Young's modulus of the composite material in the fibre direction.

ii) Young's modulus of the composite material in the transverse direction. **(06 Marks)**

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17ME33

Third Semester B.E. Degree Examination, Aug./Sept.2020
Basic Thermodynamics

Time: 3 hrs. Max. Marks: 100

Note : i) ***Answer any FIVE full questions, choosing ONE full question from each module.***
ii) ***Use of Thermodynamic handbook is permitted.***

Module-1

1 a. Define a Thermodynamic system. Differentiate between Open system , Closed system and Isolated system. **(06 Marks)**

b. Define Work in Thermodynamics. Derive an equation for displacement work in polytropic process. **(06 Marks)**

c. A temperature scale of certain thermometer is given by the relation $t = a\ell np + b$, where a and b are constants, P is thermometric property. If at ice point and steam point the thermometric properties are found to be 1.5 and 7.5 respectively. What will be the temperature corresponding to the thermometric property of 3.5 on Celsius scale. **(08 Marks)**

OR

2 a. Compare Heat and Work. **(06 Marks)**

b. State Zeroth Law of thermodynamics and explain its significance. **(06 Marks)**

c. The properties of a closed system change following the relation between pressure and volume as PV = 3.0, where P is in bar and V is volume m^3. Calculate the work done when the pressure increases from 1.5 bar to 7.5 bar. **(08 Marks)**

Module-2

3 a. Explain the First law of thermodynamics as referred to closed system under going cyclic process. **(06 Marks)**

b. State Kelvin Plank and Clausius statement of II law of Thermodynamics. **(06 Marks)**

c. 12 kg of a fluid per minute goes through a reversible steady flow process. The properties of fluid at the inlet are $P_1 = 1.4$ bar , $V_1 = 0.04 m^3/kg$, $C_1 = 120 m/s$ and $u_1 = 920$ kJ/kg and at the exit $P_2 = 5.6$ bar , $V_2 = 0.2 m^3/kg$, $C_2 = 180$ m/s and $u_2 = 720$ kJ/kg. During the passage the fluid rejects 60kJ/s of heat and rises through 60 meters. Determine the work done during the process. **(08 Marks)**

OR

4 a. Write down the general energy equation for steady flow system when applied for the following : i) Centrifugal water pump ii) Nozzle. **(06 Marks)**

b. Show that the Kelvin Plank statement and Clausius statement of II law of thermodynamics are equivalent. **(06 Marks)**

c. A reversible heat engine operated between two reservoirs at temperatures 700^0C and 50^0C. The engine drives a reversible refrigerator which operates between reservoirs at temperatures of 50^0C and -25^0C. The heat transfer to the engine is 2500kJ and the net work output of the combined engine refrigerator plant is 400kJ. Determine the net heat transfer to the reservoir at 50^0C. **(08 Marks)**

Module-3

5 a. Mention the factors that makes a process Irreversible. **(06 Marks)**

b. Show that entropy is property and point function. **(06 Marks)**

c. Define Thermodynamic temperature scale and show that the efficiency of reversible heat engine does not depend on the working fluid. **(08 Marks)**

OR

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

b. Calculate the change in entropy of 1kg of air expanding polytropically in a cylinder behind a piston from 7 bar and 600^0C to 1.05bar. The index of expansion is 1.25. **(06 Marks)**

c. One kg of ice at -5^0C is exposed to the atmosphere which is at 20^0C. The ice melts and comes into thermal equilibrium with the atmosphere. Determine the entropy increase of the universe. Take specific heat of ice as 2.093 kJ/kg K, Latent heat of fusion of ice is 333.3 kJ/kg and specific heat of water is 4.187kJ/kg K. **(06 Marks)**

Module-4

7 a. Define : i) Critical point ii) Triple point. **(04 Marks)**

b. With a neat sketch, explain the working of a throttling calori meter. **(08 Marks)**

c. The following observations were taken with a separating and a throttling calorimeter arranged in series : Water separated = 2kg.
Steam discharged from the throttling calorimeter = 20.5kg.
Temperature of steam after throttling = 110^0C.
Initial pressure = 12 bar.
Pressure after throttling = 1 bar.
Estimate the Quality of steam. **(08 Marks)**

OR

8 a. Define i) Available energy ii) Unavailable energy iii) II Law efficiency. **(06 Marks)**

b. With the help of P – T and P – V diagrams, explain the different regions for a pure substance. **(06 Marks)**

c. 1 kg of air undergoes a polytropic compression from 1 bar 290K to 6 bar and 400K. If the temperature and pressure of the surroundings are 290K and 1 bar respectively, determine the irreversibility and the effectiveness. **(08 Marks)**

Module-5

9 a. Define i) Dalton Law of partial pressure ii) Amagat's Law of additive volumes. **(04 Marks)**

b. Derive an expression for Gas Constant (R) and Molecular Weight (M) of an Ideal gas mixture. **(08 Marks)**

c. The pressure and temperature of mixture of 4kg of O_2 and 6kg of N_2 are 4 bar and 27^0C respectively. For the mixture, determine the mole fraction of each component, specific gas constant and average molecular weight. **(08 Marks)**

OR

10 a. Define i) Dry bulb temperature ii) Wet bulb temperature iii) Relative humidity. **(06 Marks)**

b. Write a short note on Vander Waals equation. **(06 Marks)**

c. Determine the pressure of air at 205^0C having a specific volume of 0.00315 m^3/kg by means of i) Ideal gas equation ii) Vander Waals equation. **(08 Marks)**

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CBCS SCHEME

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17ME34

Third Semester B.E. Degree Examination, Aug./Sept.2020
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 an expression for deformation of tapering bar having circular cross-section. **(08 Marks)**

b. Define:
i) True stress ii) Rigidity Modulus iii) Poisson's Ratio iv) Resilience. **(04 Marks)**

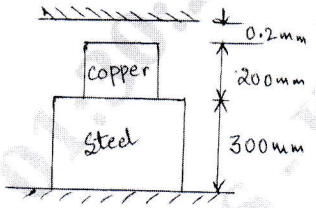
c. A steel tie rod 50mm in diameter and 5m long is subjected to a pull of 100kN. To what length the bar should be bored centrally so that the total extension will increase by 20% under the same pull, the bore being 25mm diameter. Take: E = 200GPa. **(08 Marks)**

OR

2 a. Establish the relationship between modulus of elasticity and bulk modulus in case of a cube subjected to three mutually perpendicular like tensile stresses of equal intensity 'P'. **(10 Marks)**

b. The composite bar shown in Fig.Q.2(b) is 0.2mm short of distance between the rigid support at room temperature. What is the maximum temperature rise which will not produce stresses in the bar? Find the stresses induced when temperature rise is 40°C.
Given: $\alpha_s = 12 \times 10^{-6}/°C$; $E_s = 210GPa$; $A_s : A_c = 5:4$; $\alpha_c = 17.5 \times 10^{-6}/°C$; $E_c = 120GPa$. **(10 Marks)**

Fig.Q.2(b)

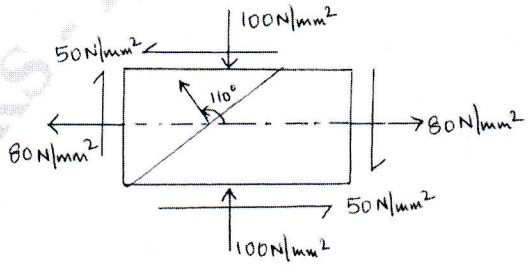


Module-2

3 a. Derive an expression for normal and shear stress on an inclined plane of member. **(08 Marks)**

b. An element with the stresses acting on it, is as shown in Fig.Q3(b) by Mohr's circle method. Determine:
i) Normal and shear stress acting on a plane whose normal is at an angle of 110° with respect to x-axis.
ii) Principal stresses and its locations.
iii) Maximum shear stresses and its location. **(12 Marks)**

Fig.Q.3(b)



OR

4 a. Derive the expressions for circumferential and radial stresses in the wall of thick cylinder (Lame's equation). **(10 Marks)**

b. A pipe of 500mm internal diameter and 75mm thick is filled with a fluid at a pressure of $6N/mm^2$. Find the maximum and minimum hoop stress across the cross section of the cylinder. Also sketch the radial pressure and hoop stress distribution across the section. **(10 Marks)**

Module-3

5 a. Define point of contraflexure. Draw the SFD and BMD for overhanging beam shown in below Fig.Q.5(a) and locate the point of centraflexure. **(15 Marks)**

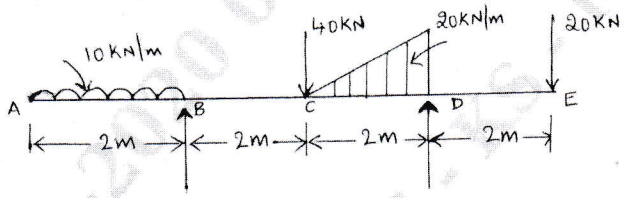


Fig.Q.5(a)

b. Explain the fire types of beam. **(05 Marks)**

OR

6 a. An I-section beam 350mm × 200mm has a web thickness of 12.5mm and a flange thickness of 25mm. It carries a shearing force of 200kN at a section. Sketch the shear stress distribution across the section. **(10 Marks)**

b. Derive an expression for differential equation for deflection curve. **(10 Marks)**

Module-4

7 a. Derive the relation for a circular solid shaft when subjected to torsion as given by $\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{\ell}$ and state the assumptions. **(10 Marks)**

b. A hollow diameter circular shaft has to transmit 60kW at 210rpm such that the maximum shear stress does not exceed $60MN/m^2$, If the ratio of internal diameter to external diameter equal to 3/4 and the value of G = 84GPa, find the dimensions of the shaft and angle of twist in a length of 3m. **(10 Marks)**

OR

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

b. Derive an expression for Euler's crippling load for a column when one of its ends are hinged or pinned. **(10 Marks)**

Module-5

9 a. Explain Rankin's theory and Guest's theory. **(08 Marks)**

b. Find the deflection at the centre of simply supported beam of length '*l*' carrying UDL of 'W' per unit length over its entire length using castigliano's theorem. **(12 Marks)**

OR

10 a. Derive an expression for strain energy stored in an elastic bar when subjected to torque and bending moment. **(10 Marks)**

b. Determine the diameter of a bolt which is subjected to an axial pull of 9kN together with a transverse shear force of 4.5kN using maximum principal stress theory. Given: The elastic limit in tension = $225N/mm^2$, FOS = 3 and Poisson's Ratio = 0.3. **(10 Marks)**

CBCS SCHEME

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17ME35A

Third Semester B.E. Degree Examination, Aug./Sept.2020
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. Explain the steps involved in metal casting process, with a neat flow diagram. **(08 Marks)**
b. Sketch and explain the elements of a Gating system. **(06 Marks)**
c. Write a note on Additives and Binders. **(06 Marks)**

OR

2 a. What are Pattern Allowances? Explain any two. **(05 Marks)**
b. Sketch and explain Sand Slinger Machine. **(05 Marks)**
c. Explain the Investment moulding, with a neat sketch. **(10 Marks)**

Module-2

3 a. Explain the construction and working principle of Cupola furnace with a neat sketch. **(12 Marks)**
b. Sketch and explain the coreless induction furnace. **(08 Marks)**

OR

4 a. With a neat sketch, explain the continuous casting process. Mention the advantages and disadvantages. **(10 Marks)**
b. What is Die Casting? With a neat sketch, explain the Hot Chamber Die Casting Process. **(10 Marks)**

Module-3

5 a. Define Solidification. Explain Progressive and Directional Solidification. **(10 Marks)**
b. What are Casting defects? Explain the features and remedies. **(06 Marks)**
c. Differentiate between Homogeneous and Heterogeneous Nucleation. **(04 Marks)**

OR

6 a. Define de – Gassification. Explain any two methods of de – Gassification. **(06 Marks)**
b. Sketch and explain the stir casting set up. Mention the advantages and disadvantages. **(08 Marks)**
c. Explain the steps involved in Fettling and cleaning of castings. **(06 Marks)**

Module-4

7 a. What is Welding? Mention the advantages and disadvantages of Welding Process. **(06 Marks)**
b. Explain Tungstun inert gas welding process with figure. Mention the advantages. **(06 Marks)**
c. Sketch and explain the Thermit Welding Process. Mention the application. **(08 Marks)**

OR

8 a. Explain the principle of seam welding with neat sketch. Mention the advantages. **(06 Marks)**
b. With neat sketch, explain the explosive Welding Process. List the applications. **(06 Marks)**
c. Sketch and explain the Laser beam welding process. Mention its application. **(08 Marks)**

Module-5

9 a. Sketch and explain the structure of Weld. (06 Marks)
b. How does Shrinkage and residual stresses affect the Welding Joints? (06 Marks)
c. Explain briefly welding defects and its causes and remedies. (08 Marks)

OR

10 a. Distinguish between Soldering , Brazing and Welding. (10 Marks)
b. Explain the following NDT methods of inspection :
i) Radiographic inspection ii) Ultrasonic inspection. (10 Marks)

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