CBCS SCHEME

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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 $u_n = \cos h\left(\frac{n\pi}{2} + 0\right)$. **(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)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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 $\vec{F}\,.\,\text{Curl}\,\vec{F} = 0$. (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).

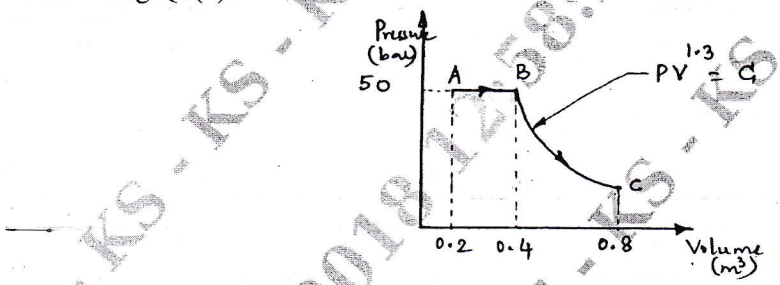

Fig Q2(b) **(10 Marks)**

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)**

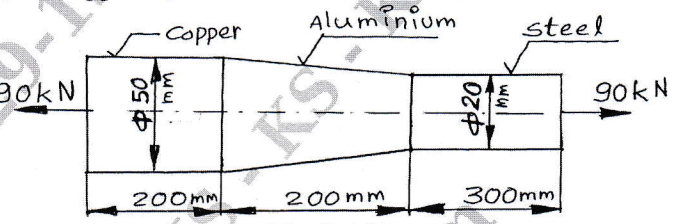

Fig.Q.1(b)

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)**

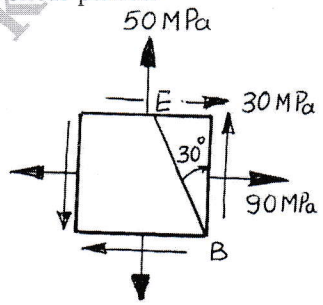

Fig.Q.3(b)

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)**

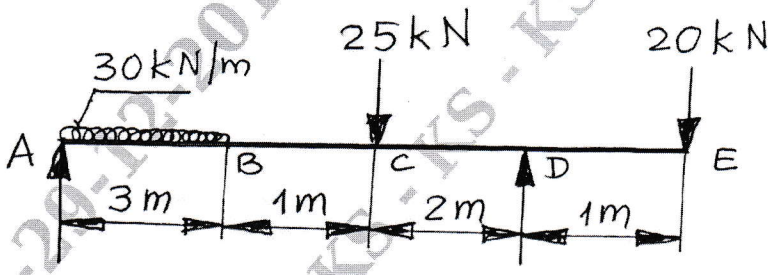

Fig.Q.5

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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