CBCS SCHEME

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18MAT31

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Transform Calculus, Fourier Series and Numerical Techniques

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 Laplace transform of $\cos t \cos 2t \cos 3t$. **(06 Marks)**

b. If $f(t) = \begin{cases} t, & 0 < t < a \\ 2a - t, & a < t < 2a \end{cases}$ and $f(t + 2a) = f(t)$, show that $L\{f(t)\} = \frac{1}{s^2} \tan h \left(\frac{as}{2}\right)$. **(07 Marks)**

c. Find the Inverse Laplace transforms of :

i) $\frac{2s+1}{s^2+6s+13}$ ii) $\frac{1}{3}\log\left(\frac{s^2+b^2}{s^2+a^2}\right)$. **(07 Marks)**

OR

2 a. Express the function f(t) in terms of unit step function and find its Laplace transform, where

$$f(t) = \begin{cases} 1, & 0 < t \le 1 \\ t, & 1 < t \le 2 \\ t^2, & t > 2 \end{cases}.$$ **(06 Marks)**

b. Find the Inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$ using Convolution theorem. **(07 Marks)**

c. Solve by the method of Laplace transforms, the equation $y'' + 4y' + 3y = e^{-t}$ given $y(0) = 0$, $y'(0) = 0$. **(07 Marks)**

Module-2

3 a. Obtain the Fourier series of the function $f(x) = x^2$ in $-\pi \le x \le \pi$. **(06 Marks)**

b. Obtain the Fourier series expansion of

$$f(x) = \begin{cases} x & , \quad 0 < x < \pi \\ x - 2\pi & , \quad \pi < x < 2\pi \end{cases}.$$ **(07 Marks)**

c. Find the Cosine half range series for $f(x) = x(\ell - x)$, $0 \le x \le \ell$. **(07 Marks)**

OR

4 a. Obtain the Fourier series of $f(x) = |x|$ in $(-\ell, \ell)$. **(06 Marks)**

b. Find the sine half range series for

$$f(x) = \begin{cases} x & , \quad 0 < x < \pi/2 \\ \pi - \pi & , \quad \pi/2 < x < \pi \end{cases}.$$ **(07 Marks)**

c. Obtain the constant term and the coefficients of the first cosine and sine terms in the Fourier expansion of y from the table. **(07 Marks)**

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

Module-3

5 a. If $f(x) = \begin{cases} 1-x^2 & , |x|<1 \\ 0 & , |x|\geq 1 \end{cases}$. Find the Fourier transform of f(x) and hence find value of $\int_0^\infty \frac{x\cos x - \sin x}{x^3} dx$. **(06 Marks)**

b. Find the Fourier Cosine transform of
$$f(x) = \begin{cases} 4x, & 0<x<1 \\ 4-x, & 1<x<4 \\ 0, & x>4 \end{cases}$$ **(07 Marks)**

c. Find the Z – transform of $\cos\left(\frac{n\pi}{2}+\frac{\pi}{4}\right)$. **(07 Marks)**

OR

6 a. Solve the Integral equation
$\int_0^\infty f(\theta)\cos\alpha\theta\, d\theta = \begin{cases} 1-\alpha & , 0\leq\alpha\leq 1 \\ 0 & , \alpha>1 \end{cases}$ hence evaluate $\int_0^\infty \frac{\sin^2 t}{t^2} dt$. **(06 Marks)**

b. Find the Inverse Z – transform of $\frac{2z^2+3z}{(z+2)(z-4)}$. **(07 Marks)**

c. Using the Z – transform, solve $Y_{n+2} - 4Y_n = 0$, given $Y_0 = 0$, $Y_1 = 2$. **(07 Marks)**

Module-4

7 a. Using Taylor's series method, solve the Initial value problem
$\frac{dy}{dx} = x^2y - 1$, y(0) = 1 at the point x = 0.1. Consider upto 4^{th} degree term. **(06 Marks)**

b. Use modified Euler's method to compute y(0.1), given that $\frac{dy}{dx} = x^2 + y$, y(0) = 1 by taking h = 0.05. Consider two approximations in each step. **(07 Marks)**

c. Given that $\frac{dy}{dx} = x - y^2$, find y at x = 0.8 with

x :	0	0.2	0.4	0.6
y :	0	0.02	0.0795	0.1762

By applying Milne's method. Apply corrector formula once. **(07 Marks)**

OR

8 a. Solve the following by Modified Euler's method
$\frac{dy}{dx} = x + |\sqrt{y}|$, y(0) = 1 at x = 0.4 by taking h = 0.2. Consider two modifications in each step. **(06 Marks)**

b. Given $\frac{dy}{dx} = 3x + \frac{y}{2}$, y(0) = 1. Compute y(0.2) by taking h = 0.2 using Runge – Kutta method of order IV. **(07 Marks)**

c. Given $\frac{dy}{dx} = (1+y)x^2$ and y(1) = 1, y(1.1) = 1.233, y(1.2) = 1.548, y(1.3) = 1.979, determine y(1.4) by Adam's Bashforth method. Apply corrector formula once. **(07 Marks)**

Module-5

9 a. Given y'' - xy' – y = 0 with y(0) = 1, y'(0) = 0. Compute y(0.2) using Runge – Kutta method. **(06 Marks)**

b. Derive Euler's equation in the form $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$. **(07 Marks)**

c. Prove that the geodesics on a plane are straight lines. **(07 Marks)**

OR

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

b. Obtain the solution of the equation $\frac{2d^2y}{dx^2} = 4x + \frac{dy}{dx}$ by computing the value of dependent variable corresponding to the value 1.4 of the independent variable by applying Milne's method using the following data. Apply corrector formula once. **(07 Marks)**

x :	1	1.1	1.2	1.3
y :	2	2.2156	2.4649	2.7514
y' :	2	2.3178	2.6725	3.0657

c. A heavy cable hangs freely under gravity between two fixed points. Show that the shape of the cable is Catenary $y = c\cosh\left(\frac{x+a}{c}\right)$. **(07 Marks)**

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CBCS SCHEME

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18ME32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
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. A mild steel bar of 25mm diameter and 200mm gauge length has an extension of 0.15mm under a load of 75kN. Load at elastic limit is 160kN and maximum load is 250kN. Total extension is 55mm. Diameter at failure is 18.5mm. Find i) Elastic limit ii) Young's modulus iii) Percentage elongation iv) Percentage reduction in area. **(06 Marks)**

b. A tapered bar of length 'L' having rectangular cross – section of constant thickness 't' is subjected to a tensile force P. Find extension of the bar. **(08 Marks)**

c. Draw typical stress – strain curve for i) Mild steel ii) Aluminum and iii) Brittle material. **(06 Marks)**

OR

2 a. A composite bar is rigidly fitted at the support A and B as shown in Fig. Q2(a). Determine the reactions at the supports when temperature rises by 20^0C. $E_{Al} = 70$ GPa , $E_{St} = 200$ GPa $\alpha_{Al} = 11 \times 10^{-6}/^0$C and $\alpha_{St} = 12 \times 10^{-6}/^0$C. **(08 Marks)**

Fig. Q2(a)

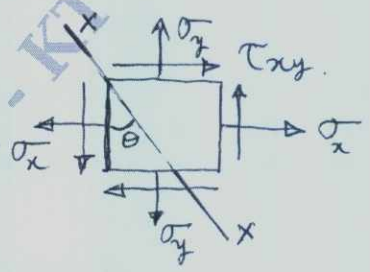
b. Define 'Bulk modulus'. Obtain an expression relating Young's modulus , Bulk modulus and Poisson's ratio. **(06 Marks)**

c. A 500mm long bar has rectangular cross – section 200mm × 40mm. This bar is subjected to
i) 40 kN tensile force on 20mm × 40mm faces
ii) 200 kN compressive force on 20mm × 500mm faces and
iii) 300 kN tensile force on 40mm × 500mm faces.
Find change in volume if E = 200 GPa and $\mu = 0.3$. **(06 Marks)**

Module-2

3 a. Obtain expressions for normal and shear stress acting on a plane XX shown in Fig. Q3(a). **(10 Marks)**

Fig. Q3(a)



b. Draw Mohr's circle and find
i) Maximum shear stress if $\sigma_x = 40$ MPa , $\sigma_y = 20$ MPa and $\tau_{xy} = 0$.
ii) Principal stresses if $\sigma_x = 0$, $\sigma_y = 0$ and $\tau_{xy} = 25$ MPa. **(10 Marks)**

OR

4 a. A thin cylinder of internal radius r_i , thickness t , length 'ℓ' is subjected to internal pressure p_i, find i) expressions for hoop stress and longitudinal stress ii) expression for volumetric strain. **(10 Marks)**

b. A thick cylinder of outside diameter 300mm and thickness 50mm is subjected to an internal pressure of 40N/mm^2 and an external pressure of 2.5N/mm^2. Find maximum and minimum values of hoop stress and radial stress, Plot the stress variations across the cylinder section. **(10 Marks)**

Module-3

5 a. Obtain expressions relating load, shear force and bending moment. **(06 Marks)**

b. Draw the bending moment and shear force diagrams for the beam shown in Fig. Q5(b) indicating values at important sections. Also find the positions of i) Maximum bending moment ii) Maximum shear force and iii) Point of contraflexure. **(14 Marks)**

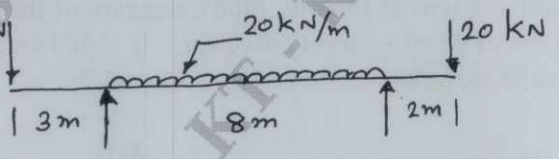


Fig. Q5(b)

OR

6 a. Stating the assumptions of Pure bending theory, derive

$$\frac{M}{I}=\frac{\sigma}{Y}=\frac{E}{R}.$$ **(10 Marks)**

b. A wooden beam 10m long , 360mm deep and 300 mm wide is simply supported and loaded with uniformly distributed load for the entire length. Maximum stress intensity of the material is 60MPa. Find the safe udℓ if factor of safety = 6. **(10 Marks)**

Module-4

7 A solid circular shaft is subjected to a bending moment of 9000 N-m and a twisting moment of 12000N-m. In a tensile test of the same material, it gave the following details :
Stress at yield point = 300Mpa ; Modulus of elasticity = 200GPa ; Poisson's ratio = 0.25.
Assuming factor of safety = 3, find the least diameter required according to i) Maximum Principal stress theory ii) Maximum Shear stress theory. **(20 Marks)**

OR

8 a. State the assumptions of 'Pure torsion' theory and prove

$$\frac{\tau_{max}}{r_0}=\frac{\tau}{r}=\frac{G\theta}{L}.$$ **(08 Marks)**

b. A hollow circular shaft with a 250mm external diameter and thickness of metal 25mm transmits power at 180 rpm. The angle of twist over a length of 3m was found to be 0.72^0. Calculate the power transmitted and the maximum shear stress induced. Modulus of rigidity = 84 GPa. **(12 Marks)**

Module-5

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

b. State the assumptions made in Euler's theory and explain limitations of Euler's estimation of critical load. **(10 Marks)**

OR

10 a. What is Strain Energy? Explain in brief. **(05 Marks)**

b. Obtain an expression for strain energy due to shear stresses. **(05 Marks)**

c. Determine the ratio of strain energy stored in two bars of the same material shown in Fig. Q10 (c), if the gradually applied load is same. **(10 Marks)**

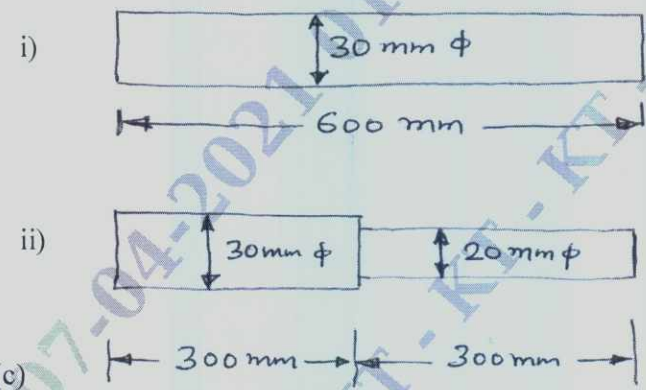


Fig. Q10(c)

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18ME33

Third Semester B.E. Degree Examination, Jan./Feb. 2021
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. Explain microscopic and macroscopic approaches to thermodynamics. **(06 Marks)**

b. State and explain Zeroth law of thermodynamics. What is diathermal and adiabatic wall? **(06 Marks)**

c. The temperature t on a Celsius thermometer scale is defined in terms of property P by the relation $P = e^{\frac{(t-B)}{A}}$ where A and B are constants. At ice point and steam points the value of P is 1.86 and 6.81 respectively. Find the value of 't' for P = 2.5. **(08 Marks)**

OR

2 a. With examples distinguish between:
(i) Intensive and extensive property
(ii) Point and path function
(iii) Thermodynamic equilibrium **(10 Marks)**

b. In 1709m Newton proposed a linear temperature scale where ice point and normal human body temperature are maintained as two fixed points of 0°N ad 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)**

Module-2

3 a. Obtain the expression for displacement adiabatic work. **(06 Marks)**

b. Define heat and work with reference to thermodynamic point of view and also the sign convention of heat and work. **(06 Marks)**

c. A cylinder contains 1 kg of certain fluid at an initial pressure of 20 bar. The fluid is allowed to expand reversibly behind a piston according to law PV^2 = constant until the volume is doubled. The fluid is then cooled reversibly at constant pressure until the piston regains its original position. Heat is then supplied reversibly with the piston firmly locked in position until the pressure rises to its original value of 20 bar. Calculate the net work done by the fluid for an initial volume of 0.05 m^3. **(08 Marks)**

OR

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

b. The working fluid in a steady flow process flows at the rate of 220 kg/min. the fluid rejects 100 kJ/s of heat passing through the system. The fluid enters at a velocity of 320 m/s, pressure of 6 bar, internal energy 2000 kJ/kg, specific volume of 0.36 m^3/kg and leaves the system at a velocity of 140 m/s, pressure of 1.2 bar, internal energy 1400 kJ/kg, specific volume of 1.3 m^3/kg. Determine the power output in MW. The change in potential energy is neglected. **(10 Marks)**

Module-3

5 a. Prove that Kelvin-Planck statement and clausius statements of second law of thermodynamic are equivalent. **(10 Marks)**

b. 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°C and –20°C. The heat transfer to the heat engine is 2000 kJ and net work output of combined engine refrigerator plant is 360 kJ. Evaluate the heat transfer to the refrigerant and net heat transfer to the reservoir at 40°C. **(10 Marks)**

OR

6 a. Show that entropy is a property of the system. **(04 Marks)**

b. Derive the maximum work attainable from a finite body and a thermal energy reservoir. **(10 Marks)**

c. A lump of steel of mass 10 kg at 627°C is dropped in 100 kg of oil at 30°C. The specific heats of steel and oil are 0.5 kJ/kgK and 3.5 kJ/kgK respectively. Calculate the entropy change of steel, the oil and the universe. **(06 Marks)**

Module-4

7 a. Explain the concept of available and unavailable energy. **(04 Marks)**

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

c. A vessel of volume 0.04 m^3 contains a mixture of saturated water and saturated steam of a temperature of 250°C. The mass of liquid present is 9 kg. Find the pressure, mass, specific volume, enthalpy 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 10 bar and dry state is cooled under constant pressure until it becomes 0.85 dry. Using steam tables, find the work done, change in enthalpy, heat transferred and change in entropy. **(10 Marks)**

Module-5

9 a. Determine the Vander Waal's constant in terms of critical properties. **(08 Marks)**

b. Explain the following:
(i) Generalized compressibility chart
(ii) Law of corresponding state
(iii) Compressibility factor **(04 Marks)**

c. Determine the pressure exerted by carbon dioxide in a container of 1.5 m^3 capacity when it contains 5 kg at 27°C using (i) Ideal gas equation (iii) Vander Waal's equation. Take Vander Waal's constant for CO_2 as a = 364.3 $kNm^4/kgmol^2$, b = 0.0427 $m^3/kgmol$. **(08 Marks)**

OR

10 a. Explain Dalton's law if partial pressure and Amagat's law of additive volumes with reference to ideal gas mixture. **(08 Marks)**

b. Derive an expression for internal energy and enthalpy of gaseous mixtures. **(04 Marks)**

c. A mixture of gases contains 1 kg of CO_2 and 1.5 kg and N_2. The pressure and temperature of the mixture are 3.5 bar and 27°C. Determine for the mixture :
(i) The mass and mole fraction of each constituent gas
(ii) Average molecular weight
(iii) The partial pressure **(08 Marks)**

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CBCS SCHEME

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18ME34

Third Semester B.E. Degree Examination, Jan./Feb. 2021
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. Calculate APF for FCC crystal structure. **(06 Marks)**

b. Discuss briefly point and line imperfections in crystals. **(06 Marks)**

c. What is Fick's law of diffusion? Explain the factors affecting diffusion. **(08 Marks)**

OR

2 a. With a stress – strain diagram for mild steel. Explain yield strength, ductility , toughness and ultimate tensile strength. **(06 Marks)**

b. Show that $\epsilon' = \ln(1 + \epsilon)$. **(04 Marks)**

c. A plain – carbon steel rod is subjected to a tensile load of 7000 kg. Assume no change in volume during extension, determine engineering stress, engineering strain , true stress and true - strain. The initial diameter of the rod is 13mm and the specimen under load is 12mm. **(10 Marks)**

Module-2

3 a. Discuss Type I , Type II and Type III fractures. **(10 Marks)**

b. What is Fatigue? Explain fatigue testing with a sketch. **(06 Marks)**

c. Explain three stages of Creep process. **(04 Marks)**

OR

4 a. What is a Solid solution? Discuss Hume – Rothary rules for formation of Solid - solution. **(05 Marks)**

b. Draw a neat Iron – Carbon equilibrium diagram and label all phases and write invariant reactions like eutectoid , eutectic and peritectic reactions. **(10 Marks)**

c. Derive an expression for critical radius in homogeneous nucleation and discuss the significance of this critical radius. **(05 Marks)**

Module-3

5 a. Explain Annealing , Normalizing and Hardening heat treatment processes. **(06 Marks)**

b. With the help of TTT and CCT diagrams, explain mar tempering and give one industrial application. **(10 Marks)**

c. What is Hardenability? Discuss various factors affecting hardenability. **(04 Marks)**

OR

6 a. Discuss 'Nitriding' and 'Flame – hardening' processes. **(08 Marks)**

b. With Aℓ - Cu phase diagram, explain age – hardening process. **(08 Marks)**

c. Explain properties, composition and uses of Gray Cast Iron. **(04 Marks)**

Module-4

7 a. Give a broad classification of composites. **(04 Marks)**

b. Discuss various applications of composites. **(06 Marks)**

c. Explain 'Pultrusion process' for manufacturing composites. **(10 Marks)**

OR

8 a. Discuss 'Characterization of Composites'. (06 Marks)

b. Explain 'Filament winding process' for producing FRPs. (08 Marks)

c. Calculate the modulus of elasticity, tensile strength and the fraction of the load carried by the fibre for the following composite material stresses under iso strain condition. The composite consists of a continuous glass fibre – reinforced epoxy resin produced by using 60% by volume of E – glass fiber having a modulus of elasticity of 72400×10^6 N/m^2 and a tensile strength of 2400×10^6 N/m^2 and a hardened epoxy resin with a modulus of elasticity of 3100×10^6 N/m^2 and a tensile strength of 60×10^6 N/m^2. (06 Marks)

Module-5

9 a. Explain types and properties of Ceramics. (08 Marks)

b. Explain 'Injection and Moulding' process for producing polymers. (06 Marks)

c. List out various applications of ceramics and polymers. (06 Marks)

OR

10 a. What are Smart Materials? Discuss the functioning of shape memory alloy. (08 Marks)

b. Explain biological and other applications of SMA. (06 Marks)

c. What are the factors to be considered for the Selection of materials? Discuss. (06 Marks)

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CBCS SCHEME

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18ME35A

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Metal Cutting and Forming

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. With a neat sketch explain the types of chips formed during metal cutting. **(06 Marks)**

b. Explain the following machining factors.
i) Cutting speed ii) Depth of cuts iii) Metal Removal Rate (MRR) iv) Feed **(08 Marks)**

c. While machining a mild steel rod on the lathe, following results are obtained:
Width of cut = 2.5mm, uncut chips thickness = 0.27mm, chip thickness = 0.7mm, Rake angle = 0 degree, cutting force = 900N. Thrust force = feed force = 450N. Determine:
i) Chip thickness ratio ii) Chip reduction co efficient
iii) Shear angle iv) Coefficient of friction. **(06 Marks)**

OR

2 a. With neat sketch, how is the size of lathe determined. **(06 Marks)**

b. List and briefly explain the any four operations carried out on lathe. **(10 Marks)**

c. Differentiate between turret and capstan lathe. **(04 Marks)**

Module-2

3 a. Explain the following operations in milling machine:
i) Plain milling ii) Face milling
iii) Angular milling iv) Key slot and groove milling **(08 Marks)**

b. With a neat sketch explain any one type of drilling machine. **(06 Marks)**

c. With a neat sketch explain the operation of Boring, Reaming and Counter Sinking. **(06 Marks)**

OR

4 a. With a neat sketch explain the hydraulic mechanism of a shaper. **(08 Marks)**

b. Mention the advantage and disadvantages of planer. **(06 Marks)**

c. With a neat sketch, explain the plain cylindrical grinding. **(06 Marks)**

Module-3

5 a. What are the factors affecting the tool life. **(08 Marks)**

b. List and explain the types of cutting fluids. **(06 Marks)**

c. List and explain the any two cutting tool materials. **(06 Marks)**

OR

6 a. Briefly explain the economical of metal machining process. **(08 Marks)**

b. Define tool wear. Explain the various form of tool failure. **(08 Marks)**

c. Briefly explain the machinability. **(04 Marks)**

Module-4

7 a. Explain the hot and cold working processes, mention its advantages and disadvantages. **(14 Marks)**

b. Differentiate between press forging and drop forging. **(06 Marks)**

OR

8 a. Explain the various defects in forging. (06 Marks)
b. List the types of rolling mills. Explain any two types of rolling mills. (08 Marks)
c. With a neat sketch explain the wire drawing and tube drawing process. (06 Marks)

Module-5

9 a. With a neat sketch explain the blanking and punching (piercing). (06 Marks)
b. With a neat sketch explain the steps in shearing process. (08 Marks)
c. Differentiate between compound die and progressive die. (06 Marks)

OR

10 a. With a neat sketches explain the embossing and coining operation. (08 Marks)
b. With a neat sketches, explain the following dies,
a) Combination die. b) Progressive die. (12 Marks)

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CBCS SCHEME

18CPC39/49

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Question Paper Version : A

Third/Fourth Semester B.E. Degree Examination, Jan./Feb. 2021
Constitution of India, Professional Ethics and Cyber Law
(COMMON TO ALL BRANCHES)

Time: 2 hrs.] [Max. Marks: 100

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the hundred 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, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. The fundamental rights guaranteed by the Constitution of India to its citizens can be protected by
   a) Parliament b) President
   c) Supreme court d) Union Home Minister

2. Which is the key to open the minds of the makers of the constitution?
   a) Preamble b) Parliament c) Judiciary d) Part – III (FRS)

3. Who was the Chairman and Chief Architect of the Indian Constitution?
   a) Jawaharlal Nehru b) Mahatma Gandhi
   c) Dr. B.R. Ambedkar d) Mount Batten

4. Which is the basis or test for the classification of people under Art.14?
   a) Caste b) Intelligible quotient
   c) Intelligible differentia d) Annual income

5. The Parliamentary system of Government of India is based on the pattern of
   a) USA b) UK c) USSR d) China

6. Which of the following is not a fundamental right?
   a) Right to trade b) Right to property
   c) Right to life d) Right to form an association or union

7. The directive principles of state policy are
   a) Enforceable by court b) Not enforceable by court
   c) Absolute principles d) None of these

8. The practice of untouchability is prohibited under
a) Art.14 b) Art.15 c) Art.16 d) Art.17

9. Which of the ground replaced the internal disturbance by amendment in the year 1977?
a) War b) External aggression
c) Armed rebellion d) Terrorist activities

10. Which article has amended recently to remove the special status to the state of Jammu and Kashmir?
a) Art. 368 b) Art. 370 c) Art. 372 d) Art. 380

11. How many members are there in the election commission including its chairman?
a) 5 b) 4 c) 3 d) 2

12. Who is empowered to proclaim the state emergency?
a) Union President b) Parliament c) Governor of a state d) Prime Minister

13. Who is having the power to amend the provisions of the Constitution under Article 368?
a) Parliament b) President c) Union cabinet d) Supreme court

14. How many members are nominated to Rajyasabha by the President of India?
a) Two b) 20 c) 12 d) One

15. High Court Judge retires at the age of …….
a) 65 years b) 58 years c) 60 years d) 62 years

16. Who can appoint the Chief Justice of Supreme court of India?
a) Prime Minister b) Law Minister c) President d) Attorney-General

17. Money Bill will be introduced only in …..
a) Cabinet b) Loka Sabha c) Rajya Sabha d) Any one of these

18. "Equal Pay for Equal Work" for the men and women is included under
a) Part-II Citizenship b) Part-III : Fundamental Rights
c) Part-IV DPSP d) Part-V-A : Fundamental Duties

19. The right to freedom of press and publication are included in …..
a) Right to personal liberty b) Right to speech and expression
c) Right to move anywhere in India d) Right to trade

20. By which amendment, right to education made fundamental right and a new provision, Art.21-A was included in the constitution?
a) 44th Amendment b) 76th Amendment c) 86th Amendment d) 91st Amendment

21. The term of the selection commissioner is
a) 3 years
b) 4 years
c) 6 years or till he attains the age of 65 years
d) 5 years or till he attains the age of 62 years

22. Which one is not a kind of trade mark?
a) Designs b) Symbols c) Sounds d) Goodwill

23. Which is the very essential element in professional ethics?
a) Honesty b) Responsibility c) Risk d) Over-confidence

24. Who is the ex-officio-chairman of Rajya Sabha?
a) President b) Vice-President c) Prime Minister d) None of these

25. Which one of the following is not a fundamental right under Art. 21?
a) Right to life b) Right to dignity c) Right to privacy d) Right to suicide

26. If the Head of the State is an elected functionary for a fixed term, it is known as
a) Unitary b) Federal c) Republic d) Democratic

27. Which schedule gives details regarding the subjects included in the three lists – Central, State and Concurrent?
a) Schedule - VII b) Schedule - VIII c) Schedule - V d) Schedule - IV

28. 'Sovereign' means
a) Independent Supreme Authority b) Absolutism
c) Dependent Authority d) Dictatorship

29. A person can move to the Supreme Court directly for any violation of his Fundamental Right under Article .....
a) 12 b) 22 c) 32 d) 226

30. Which one of the following is not included under the definition of state in Art.12?
a) Parliament b) Corporations c) Executive d) Judiciary

31. Indian Constitution is silent on the concept of
a) Deputy Speaker of Loka Sabha b) Deputy Prime Minister
c) Deputy Chief Minister d) Both (b) and (c)

32. Who is the Presiding Officer of the joint-session to discuss on the controversial bill of the parliament?
a) President b) Vice-President
c) Speaker of Loka Sabha d) Prime Minister

33. Who has the power to pardon the death sentence?
a) President b) Chief Justice of Supreme Court
c) Governor of a State d) Both (b) and (c)

34. Who can disqualify the MLAs, if they act against anti-defection law?
a) Speaker of Loka Sabha b) Speaker of Legislative Assembly
c) Prime Minister d) Chief Minister of a State

35. What is the term of member of Rajya Sabha?
a) 5 years b) 6 years c) 4 years d) 2 years

36. Which bill is to be introduced only in Loka Sabha?
a) Ordinary bill b) Money bill c) Amendment bill d) None of these

37. The protection, "No person is to be forced or compelled to say the witness against himself" is
a) Ex-Post Facto Law b) Double Zeo Pardy
c) Self-Incrimination d) Testimonial Compulsion

38. Phishing is
a) a cyber crime b) civil wrong c) a net work d) a type of computer

39. Child Pornography is
a) Exposure of social behaviour of children
b) Exploitation of children in the porn industry
c) Not a cyber crime
d) appreciable one

40. Which is the India's cybercrime capital?
a) Bombay b) Delhi c) Bengaluru d) Calcutta

41. Federal type of Government means
a) Division of powers between Centre and State
b) Distribution of powers between legislature and executive
c) Separation of powers between President and Prime Minister
d) None of the above

42. How much time taken to draft the Indian Constitution to adopt?
a) 03 years 10 months 07 days b) 05 years 11 months 19 days
c) 04 years 11 months 17 days d) 02 years 11 months 18 days

43. The seat of Supreme Court is in
a) Bangaluru b) Delhi c) Mumbai d) Chennai

44. Which article recognized the international law under constitution?
a) Art. 32 b) Art. 42 c) Art. 50 d) Art. 51

45. Writ of 'Habeaus Corpus' means
a) To command to do a duty b) To quash the decision
c) To produce the person before the court d) On what authority?

46. The right to public appointment has been provided in
a) Art. 14 b) Art. 15 c) Art. 16 d) Art. 20

47. Reasonable restrictions can be imposed by the state under the provision of …….
a) Art. 19(1)(a) to (g) b) Art. 19 (2) to (6)
c) Art. 20 (a) to (c) d) Art. 21

48. An arrested person is to be allowed to …….
a) Choose his own advocate b) Contact the political people
c) Contact nearest magistrate d) Contact his relative

49. Any law made by the Parliament in contravention to the fundamental rights is declared as…….
a) Valid b) Illegal c) Void d) Incorrect

50. Who are not entitled to form a Union or Association?
a) Police b) Students
c) Teachers d) Workmen of an industry

51. The punishment for identity theft (making use of the electronic signature or password fraudulently) in India is …….
a) 6 years b) 3 years c) 10 years d) 3 months

52. What is serious crime in Cyber Law which attracts a prison sentence for 20 years or more?
a) Fraud b) Child pornography c) Software Piracy d) Hacking

53. One of the ways of misusing the truth is
a) Making the confused statement b) Falsihood
c) Deliberate deception d) Misrepresentation

54. One of the aims of engineering ethics is to
a) Acquire new skills in engineering
b) Stimulate to conduct research
c) Stimulate the moral imagination
d) Train to acquire self-confidence in their duties

55. Which of the provisions cannot be suspended during national emergency?
a) Arts. 14 and 15 b) Arts. 23 and 24 c) Arts. 20 and 21 d) Arts. 17 and 18

56. The constitution expressly permits the state to make special provisions for
a) Women and unemployed persons
b) Socially and educationally backward class people
c) Old, sick and disabled persons
d) Senior citizens

57. 'Creamy layer' means
a) Highly educated persons b) Illiterate persons
c) Highly cultured persons d) Persons having higher incomes

58. Under fundamental rights, Minority may be considered on the basis of
a) Linguistic or religious b) Regional or national
c) Racial or regional d) Caste or racial

59. The right against exploitation prohibits
a) Labourers b) Mining employees sufferings
c) Traffic in human beings d) None of these

60. The Supreme Court can issue the appropriate writ when there is a violation of .....
a) Fundamental right b) Fundamental duties
c) Directive principles d) None of these

61. Which writ can be issued to quash the decision of lower courts?
a) Habeaus corpus b) Mandamus c) Prohibition d) Certiorari

62. The rights of citizens to take out processions or meeting is conferred by
a) Right to form an association b) Right to move anywhere in India
c) Right to assembly d) Right to carryon any trade

63. Which of the following word was added to the preamble of the constitution by the 42nd Amendment Act, 1976?
a) Secular b) Republic c) Sovereign d) Democratic

64. Who can appoint the Chief Justice and other Judges of the Supreme Court?
a) Prime Minister b) President c) Law Minister d) Vice-President

65. The doctrine of 'Rule of Law' is profounded by
a) Dr. A.V. Dicey b) Dr. B.R. Ambedkar c) Kelson d) Bentham

66. What is the source of law in India?
a) Common law principles
b) Constitution of India
c) Supreme Court of India
d) Union Legislature (Parliament)

67. Who can be removed by the process of "impeachment"?
a) Prime Minister b) Governor c) District Judge d) President

68. What is the basic attitude towards responsibility of engineer?
a) Absolute responsibility
b) Reasonable care
c) Personal safety
d) Strict guidelines

69. Which fund is utilized to meet the unforeseen expenditure?
a) Contingency Fund of India
b) Consolidated Fund of India
c) Public Revenue Fund
d) Political Party Fund

70. Attorney-General of India is appointed by
a) Prime Minister
b) Law Minister
c) President
d) Chief Justice of Supreme Court

71. Who can certify the money bill immediately when it is introduced in the Loka Sabha?
a) Speaker b) Deputy Speaker c) Finance Minister d) Prime Minister

72. Under which Article the state has been directed to secure for the citizens a 'uniform civil code' in India?
a) Art. 44 b) Art. 45 c) Art. 48 d) Art. 54

73. Which of the following refers to dishonesty in engineering ethics?
a) Self-interest b) Cooking c) Self-deception d) Fear

74. Who among the following is empowered to suspend or revoke the license to issue digital signature certificate granted to a certifying authority?
a) Adjudicating Officer
b) Central Government
c) Controller
d) Cyber Appellate Tribunal

75. Who can appoint the Presiding Officer of the cyber appellate tribunal?
a) Central Government
b) State Government
c) President
d) Chief Justice of India

76. Software Piracy means
a) An attacker harasses a victim on line
b) Sending huge volumes of e-mail by an abuser to target address
c) Illegal copying, distribution, or use of software/computer
d) any software used to disrupt computer or mobile operations

77. Gaining and unauthorized access to the data or information stored in a computer system is called:
a) Malware b) Hacking c) Phishing d) Web Jacking

78. What is a Mobile or SIM cloning?
a) Thefting of information
b) Someone obtains others personal information
c) Copying the identity of one mobile telephone to another mobile telephone
d) All of the above

79. One of the modes of regulation of internet is .....
a) Customs b) Norms c) International Law d) Native code

80. An important law relating to Indian cyber laws is
a) Right to Information Act b) Right to Education Act
c) the Information Technology Act d) E-Commerce Code

81. 'Fault Tree' method is used
a) To assess the risk b) In engineering research
c) To trace the fault of engineers d) to assess the accuracy of work

82. Under which law, a case is filed to recover damages when harm is caused from technology?
a) Constitutional Law b) Industrial Law c) Law of Torts d) Law of Crimes

83. Revealing confidential information amounts to
a) Misusing the truth
b) Breach of contract
c) Using of Copyright without the permission owner
d) Criminal breach of trust

84. The owner of the patent right retains his patent right for
a) 50 years b) 75 years c) 20 years d) 10 years

85. When a state emergency is declared, who can assume all the functions of State Government?
a) Prime Minister b) President of India
c) Governor of a State d) Union Cabinet

86. The Election Commission has no power to conduct the election to
a) Parliament b) President
c) Speaker of Loka Sabha d) State Legislature

87. Who can appoint Prime Minister of India?
a) The people of India b) The President of India
c) Ruling Legislative Party d) Election Commissioner

88. What is the maximum strength of Rajya Sabha?
a) 224 b) 250 c) 288 d) 543

89. Vice-President of India is elected by the
a) People of India b) Members of State Legislature
c) Members of Rajya Sabha d) Members of both the houses of parliament

90. What is the minimum age to become the judges of the Supreme Court?
a) 25 years b) 30 years c) 35 years d) None of these

91. Chief Minister of a state is appointed by
a) Governor b) President
c) High Command of a political party d) Chief Justice of the High Court

92. Which one of the following is not a fundamental duty?
a) Respect the National Flag and National Anthem
b) Not to destroy public property
c) Protection of environment and forest
d) Parents or wards may not send their children to school

93. The constitution empowered State Government to make special law for the protection of
a) Factory workmen
b) Unemployed youth
c) Women and children
d) Farmers

94. Every citizen of India is eligible to vote in an election after attaining the age of
a) 21 years b) 16 years c) 25 years d) 18 years

95. Total number of articles and schedules in Indian Constitution are
a) 397 Articles and 6 Schedules
b) 385 articles and 8 Schedules
c) 440 Articles and 10 Schedules
d) 445 Articles and 12 Schedules

96. In engineering ethics, "tight coupling" means
a) Strong adhesive material
b) Binding two beams tightly
c) Process tightly coupled
d) Erecting two pillars side by side

97. Who is the Constitutional Head of the Nation?
a) Chief Justice of India
b) President of India
c) Prime Minister of India
d) Union External Affairs Minister

98. The resignation letter of President can be received and accepted by
a) Chief Justice of India
b) Vice-President of India
c) Prime Minister of India
d) Speaker of Loka Sabha

99. Who can administer the oath to the Chief Minister and Cabinet Minister of State Government?
a) President of India
b) Governor of State
c) Chief Justice of High Court
d) Advocate-General of State

100. The President can promulgate on ordinance only when
a) The parliament is not in session
b) There is a disagreement between the two houses of parliament
c) The bill is in pending in the parliament for a year and above
d) The Prime Minister recommends at anytime.

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CBCS SCHEME

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18MATDIP31

Third Semester B.E. Degree Examination, Jan./Feb. 2021
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 $1-i\sqrt{3}$ in the polar form and hence find its modulus and amplitude. **(06 Marks)**

c. Find the argument of $\frac{1+\sqrt{3}i}{1-\sqrt{3}i}$. **(06 Marks)**

OR

2 a. If $\vec{A}=4\hat{i}+3\hat{j}+\hat{k}$ and $\vec{B}=2\hat{i}-\hat{j}+2\hat{k}$ find a unit vector $\hat{N}$ perpendicular to both $\vec{A}$ and $\vec{B}$ such that $\vec{A}$, $\vec{B}$ and N from a right handed system. **(08 Marks)**

b. If $\vec{a}=\hat{i}+2\hat{j}-3\hat{k}$ and $\vec{b}=3\hat{i}-\hat{j}+2\hat{k}$ then show that $(\vec{a}+\vec{b})$ and $(\vec{a}-\vec{b})$ are orthogonal. **(06 Marks)**

c. Show that the position vectors of the vertices of a triangle $\vec{A}=3(\sqrt{3}\,\hat{i}-\hat{j})$, $\vec{B}=6\hat{i}$ and $C=3(\sqrt{3}i+j)$ form an isosceles triangle. **(06 Marks)**

Module-2

3 a. Obtain the Maclaurin series expansion of log secx upto to the terms containing x^6. **(08 Marks)**

b. If $u=\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$, prove that $xu_x+yu_y=\sin 2u$. **(06 Marks)**

c. If $u=f(x-y, y-z, z-x)$, show that $u_x+u_y+u_z=0$. **(06 Marks)**

OR

4 a. Prove that $\log(1+x)=x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}\ldots$ by using Maclaurin's series notation. **(08 Marks)**

b. Using Euler's theorem, prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=3u\log u$. If $u=e^{\frac{x^2y^2}{x+y}}$. **(06 Marks)**

c. If $u=x+y$, $v=y+z$, $w=z+x$, find $J\left(\frac{u,v,w}{x,y,z}\right)$. **(06 Marks)**

Module-3

5 a. A particle moves along the curve $\vec{r}=\cos 2t\,\hat{i}+\sin 2t\,\hat{j}+t\,\hat{k}$, find the velocity and acceleration at $t=\frac{\pi}{8}$ along $\sqrt{2}\,\hat{i}+\sqrt{2}\,\hat{j}+\hat{k}$. **(08 Marks)**

b. Find the unit normal to the surface, $xy+x+zx=3$ at (1, 1, 1). **(06 Marks)**

c. Find the constant 'a' such that the vector field $\vec{F}=2xy^2z^2\hat{i}+2x^2yz^2\hat{j}+ax^2y^2z\hat{k}$ is irrotational. **(06 Marks)**

OR

6 a. If $\vec{F} = (x+y+1)\hat{i} + \hat{j} - (x+y)\hat{k}$ show that $\vec{F}.\text{curl}\,\vec{F} = 0$. **(08 Marks)**

b. If $\phi(x,y,z) = xy^2 + yz^3$, find $\nabla\phi$ & $|\nabla\phi|$ at (1, -2, -1) **(06 Marks)**

c. Show that vector field $\vec{F} = \left[\frac{x\hat{i} + y\hat{j}}{x^2 + y^2}\right]$ is solenoidal. **(06 Marks)**

Module-4

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

b. Evaluate $\int_0^1 \frac{x^9}{\sqrt{1-x^2}} dx$. **(06 Marks)**

c. Evaluate $\iint_R xydxdy$ where R is the first quadrant of the circle $x^2 + y^2 = a^2$, $x \geq 0$, $y \geq 0$. **(06 Marks)**

OR

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

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

c. Evaluate $\int_{-1}^{1}\int_{0}^{z}\int_{x-2}^{x+2}(x+y+z)dydxdz$ **(06 Marks)**

Module-5

9 a. Solve $\frac{dy}{dx} + y\cot x = \sin x$. **(08 Marks)**

b. Solve $\cos x \sin y dx + \cos y \sin x dy = 0$. **(06 Marks)**

c. Solve $\frac{dy}{dx} + \frac{y}{x} = y^2 x$. **(06 Marks)**

OR

10 a. Solve : $\frac{dy}{dx} + \frac{y\cos x + \sin y + y}{\sin x + x\cos y + x} = 0$. **(08 Marks)**

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

c. Solve : $\sqrt{1-y^2}dx = \left(\sin^{-1} y - x\right)dy$ **(06 Marks)**

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