USN | | | | | | | | | | 18MAT31

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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:

   (i) $\left(\dfrac{4t+5}{e^{2t}}\right)^2$ (ii) $\left(\dfrac{\sin 2t}{\sqrt{t}}\right)^2$ (iii) $t\cos at$.   **(10 Marks)**

   b. The square wave function f(t) with period 2a defined by $f(t)=\begin{cases} 1 & 0\le t<a \\ -1 & a\le t<2a \end{cases}$. Show that $\left(\dfrac{1}{s}\right)\tanh\left(\dfrac{as}{2}\right)$.   **(05 Marks)**

   c. Employ Laplace transform to solve $\dfrac{d^2y}{dt^2}-\dfrac{dy}{dt}=0$, $y(0)=y_1(0)=3$.   **(05 Marks)**

OR

2 a. Find (i) $L^{-1}\left\{\dfrac{s^2-3s+4}{s^3}\right\}$ (ii) $\cot^{-1}\left(\dfrac{s}{2}\right)$ (iii) $L^{-1}\left\{\dfrac{s}{(s+2)(s+3)}\right\}$ **(10 Marks)**

   b. Find the inverse Laplace transform of, $\dfrac{1}{s(s^2+1)}$ using convolution theorem.   **(05 Marks)**

   c. Express $f(t)=\begin{cases} 2 & \text{if } 0<t<1 \\ \dfrac{t^2}{2} & \text{if } 1<t<\dfrac{\pi}{2} \\ \cos t & t>\dfrac{\pi}{2} \end{cases}$ in terms of unit step function and hence find its Laplace transformation.   **(05 Marks)**

Module-2

3 a. Obtain the Fourier series of $f(x)=\begin{cases} 2 & -2<x<0 \\ x & 0<x<2 \end{cases}$.   **(08 Marks)**

   b. Find the half range cosine series of, $f(x)=(x+1)$ in the interval $0\le x\le 1$.   **(06 Marks)**

   c. Express $f(x)=x^2$ as a Fourier series of period 2π in the interval $0<x<2\pi$.   **(06 Marks)**

OR

4   a.   Compute the first two harmonics of the Fourier Series of f(x) given the following table :

x°	0	60°	120°	180°	240°	300°
y	7.9	7.2	3.6	0.5	0.9	6.8

(08 Marks)

   b.   Find the half range size series of e^x in the interval $0 \leq x \leq 1$. **(06 Marks)**

   c.   Obtain the Fourier series of $f(x) = \dfrac{\pi^2}{12} - \dfrac{x^2}{4}$ valid in the interval $(-\pi \quad \pi)$ **(06 Marks)**

Module-3

5   a.   Find the Infinite Fourier transform of $e^{-|x|}$. **(07 Marks)**

   b.   Find the Fourier cosine transform of $f(x) = e^{-2x} + 4e^{-3x}$. **(06 Marks)**

   c.   Solve $u_{n+2} - 3u_{n+1} + 2u_n = 3^n$, given $u_0 = u_1 = 0$. **(07 Marks)**

OR

6   a.   If $f(x) = \begin{cases} 1 & \text{for } |x| \leq a \\ 0 & \text{for } |x| > a \end{cases}$, find the infinite transform of f(x) and hence evaluate $\displaystyle\int_0^\infty \dfrac{\sin x}{x} dx$.

(07 Marks)

   b.   Obtain the Z-transform of $\cosh n\theta$ and $\sinh n\theta$. **(06 Marks)**

   c.   Find the inverse Z-transform of $\dfrac{4z^2 - 2z}{z^3 - 5z^2 + 8z - 4}$ **(07 Marks)**

Module-4

7   a.   Solve $\dfrac{dy}{dx} = e^x - y$, $y(0) = 2$ using Taylor's Series method upto 4th degree terms and find the value of $y(1.1)$. **(07 Marks)**

   b.   Use Runge-Kutta method of fourth order to solve $\dfrac{dy}{dx} + y = 2x$ at $x = 1.1$ given $y(1) = 3$ (Take h = 0.1) **(06 Marks)**

   c.   Apply Milne's predictor-corrector formulae to compute $y(0.4)$ given $\dfrac{dy}{dx} = 2e^x y$, with **(07 Marks)**

x	0	0.1	0.2	0.3
y	2.4	2.473	3.129	4.059

OR

8   a.   Given $\dfrac{dy}{dx} = x + \sin y$; $y(0) = 1$. Compute $y(0.4)$ with h = 0.2 using Euler's modified method. **(07 Marks)**

   b.   Apply Runge-Kutta fourth order method, to find $y(0.1)$ with h = 0.1 given $\dfrac{dy}{dx} + y + xy^2 = 0$; $y(0) = 1$. **(06 Marks)**

   c.   Using Adams-Bashforth method, find $y(4.4)$ given $5x\left(\dfrac{dy}{dx}\right) + y^2 = 2$ with

x	4	4.1	4.2	4.3
y	1	1.0049	1.0097	1.0143

(07 Marks)

Module-5

9 a. Solve by Runge Kutta method $\dfrac{d^2y}{dx^2} = x\left(\dfrac{dy}{dx}\right)^2 - y^2$ for x = 0.2 correct 4 decimal places, using initial conditions $y(0) = 1$, $y'(0) = 0$, $h = 0.2$. **(07 Marks)**

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

  c. Find the extramal of the functional, $\displaystyle\int_{x_1}^{x_2} y^2 + \left(y'\right)^2 + 2ye^x\,dx$. **(07 Marks)**

OR

10 a. Apply Milne's predictor corrector method to compute $\dfrac{d^2y}{dx^2} = 1 + \dfrac{dy}{dx}$ and the following table of initial values:

x	0	0.1	0.2	0.3
y	1	1.1103	1.2427	1.3990
y'	1	1.2103	1.4427	1.6990

(07 Marks)

  b. Find the extramal for the functional, $\displaystyle\int_{0}^{\frac{\pi}{2}} \left[y^2 - y'^2 - 2y\sin x\right]dx$; $y(0) = 0$; $y\left(\dfrac{\pi}{2}\right) = 1$. **(06 Marks)**

  c. Prove that geodesics of a plane surface are straight lines. **(07 Marks)**

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USN [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]   **18ME32**

Third Semester B.E. Degree Examination, Dec.2019/Jan.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. Define the following terms:
    (i) Stress (ii) Strain   (iii) Young's Modulus   (iv) Poisson's ratio (v) Hooke's law.
                                                                          (05 Marks)
   b. Derive an expression for the total elongation of a tapered circular bar cross section of diameter 'D' and 'd', when subjected to an axial load 'P'.   **(05 Marks)**
   c. A brass bar having cross sectional area of 1000 mm^2, is subjected to axial forces shown in Fig. Q1 (c). Find the total elongation of the bar. Take E = 100 GN/m^2.   **(10 Marks)**
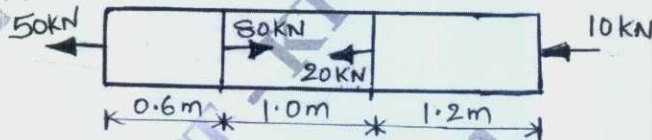

Fig. Q1 (c)

OR

2 a. Draw stress strain diagram for mild-steel and mark all the salient points. **(04 Marks)**
   b. A concrete column of cross sectional area 400mm × 400mm is re-inforced by 4 longitudinal 50 mm diameter steel bars placed at each corner. If the column carries a comprehensive load of 300 kN, determine (i) Loads carried   (ii) Stress produced in the concrete and Steel bars.   **(08 Marks)**
   c. A steel rod 15 m long at a temperature of 15°C. Find the free expansion of length when the temperature is raised to 65°C. Find the temperature stresses produced, when
       (i)   The expansion of the rod is prevented.
       (ii) The rod is permitted to expand by 6 mm.
       Take $\alpha = 12 \times 10^{-6} /°C$ and $E = 2 \times 10^5 N/mm^2$ **(08 Marks)**

Module-2

3   The state of stress at a point in a strained material is shown in Fig. Q3. Determine
     a) The direction of the principal planes.
     b) The magnitude of principal stresses.
     c) The magnitude of the maximum shear stress and its direction.
     d) Draw Mohr's circle and verify the results obtained analytically.
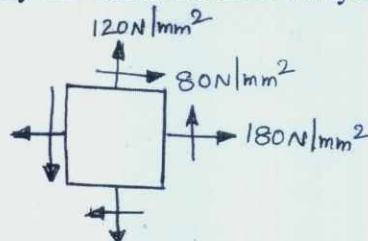

Fig. Q3   **(20 Marks)**

OR

4 a. Differentiate between thin and thick cylinders. **(04 Marks)**

   b. Derive an expression for circumferential stress and longitudinal stress for a thin cylinder subjected to an internal pressure 'P'. **(06 Marks)**

   c. A thick cylinder of 400 mm internal diameter and 100 mm thickness contains a fluid at a pressure 80 N/mm². Find hoop stresses across the section. Also sketch the radial and hoop stress distribution across the section. **(10 Marks)**

Module-3

5 Draw shear force and Bending Moment Diagrams for the beam shown in Fig. Q5. Locate the point of contraflexure. **(20 Marks)**
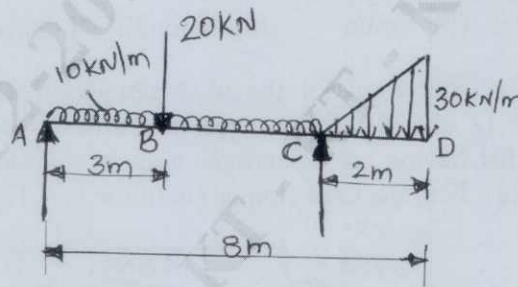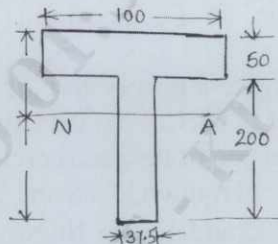

Fig. Q5

OR

6 a. Prove the relation $\dfrac{M}{I} = \dfrac{\sigma}{y} = \dfrac{E}{R}$ with usual notations. **(10 Marks)**

   b. The T-section of a beam is shown in Fig. Q6 (b). The material of the beam has yield strength of 250 MPa. Determine maximum moment of resistance that the beam can support if yielding is to be avoided. **(10 Marks)**

Note : All dimensions are in mm.
Fig. Q6 (b)

Module-4

7 a. A mild steel shaft 120 mm diameter is subjected to a maximum torque of 20×10^6 N-mm and a maximum bending moment of 12×10^6 N-mm at a particular section. Find the factor of safety (FoS) according to the maximum stress theory, if the elastic limit in simple tension is 220 N/mm². **(10 Marks)**

   b. Prove that a hollow shaft is stronger and stiffer than the solid shaft of the same material, length and weight. **(10 Marks)**

OR

8   a.   Derive the torsional equation for a circular shaft with usual notations. State the assumptions made.   **(10 Marks)**

    b.   A hollow shaft is to transmit 300 kW power at 80 rpm. If the shear stress is not to exceed 60 N/mm^2 and internal diameter is 0.6 times the external diameter. Find the external and internal diameters, assuming that the maximum torque is 1.4 times the mean.   **(10 Marks)**

Module-5

9   a.   Derive an expression for a critical load in a column subjected to compressive load, when both ends are fixed.   **(10 Marks)**

    b.   A 2 m long column has a square cross section of side 40 mm. Taking the factor of safety as 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.
        (iv)   One end fixed and other end is hinged.

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

OR

10   a.   Derive an expression for a critical load in a column subjected to compressive load, when both ends are hinged.   **(10 Marks)**

     b.   The bar with circular cross section shown in Fig. Q10 (b) is subjected to a load of 10 KN. Determine the strain energy stored in it. Take E = 2.1×10^5 N/mm^2 **(10 Marks)**
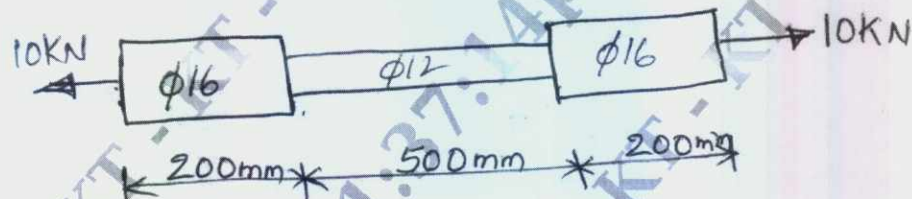

Fig. Q10 (b)

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USN | | | | | | | | | | | **18ME33**

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 hand book and steam tables is permitted.*
*   3. Assume missing data suitably.*

Module-1

1   a.   Differentiate between micro and macroscopic approach.   **(04 Marks)**
     b.   Define the following terms with neat sketch:
         (i)   Open system
         (ii)   Closed system
         (iii)   Isolated system
         (iv)   Quasi-static process   **(08 Marks)**
     c.   The temperature 'T' on a thermometric scale is defined as $T = a\ln(K) + b$, where a and b are constants. The values of K are found to be 1.83 and 6.78 at 0°C and 100°C, respectively. Calculate the temperature for value of K = 2.42.   **(08 Marks)**

OR

2   a.   Define:
         (i) Thermodynamic equilibrium
         (ii) Zeroth law of thermodynamics   **(04 Marks)**
     b.   With neat sketch explain the working principle of:
         (i) Electrical resistance thermometer
         (ii) Thermocouple   **(08 Marks)**
     c.   Two Celsius thermometer 'A' and 'B' agree at ice point and steam point, and related by the equation $t_A = L + Mt_B + Nt_B^2$, where L, M and N are constants. When both thermometers are immersed in a fluid, 'A' registers 26°C, while 'B' registers 25°C. Determine the reading of 'A' when 'B' reads 37.4°C.   **(08 Marks)**

Module-2

3   a.   Define thermodynamic work and heat.   **(04 Marks)**
     b.   Write an expression for displacement of work for the following process with P-V diagrams.
         (i)   Constant pressure
         (ii)   Constant volume
         (iii)   Constant temperature
         (iv)   Polytropic process   **(08 Marks)**
     c.   A quantity of gas is compressed in a piston-cylinder from a volume of 0.8611 m^3 to a final volume of 0.1721 m^3. The pressure in (bar) and as a function of volume (m^3) is given by:

$$P = \left(\frac{0.8611}{V} - \frac{8.6067 \times 10^{-5}}{V^2} \right)$$

         (i) Find the amount of work done in KJ.
         (ii) If the atmospheric pressure is 1 bar, acting on the other side of piston is considered. Find the net work done in KJ.   **(08 Marks)**

OR

4 a. State 1st law of thermodynamics. Derive an expression for 1st law of thermodynamics for open system (SFEE). **(10 Marks)**

b. The working fluid, in a steady flow process at a rate of 220 kg/min. The fluid rejects 100 KJ/s of heat passing through the system. The condition of the fluid at inlet and outlet are given as $\overline{V}_1$ = 220 m/s, p_1 = 6.0 bar, u_1 = 2000 KJ/kg, υ_1 = 0.36 m³/kg and p_2 = 1.2 bar, $\overline{V}_2$ = 140 m/s, u_2 = 1400 kJ/kg, υ_2 = 1.3 m³/kg. The suffix 1 and 2 indicates at inlet and outlet conditions respectively. Determine the power capacity of the system in MW. **(10 Marks)**

Module-3

5 a. Define the following terms:
   (i) Thermal reservoir
   (ii) Heat engine
   (iii) Kelvin-Plank statement of 2nd law
   (iv) Clausius statement of 2nd law
   (v) Heat pump **(10 Marks)**

b. A heat engine working on a Carnot cycle absorbs heat from three thermal reservoirs at 1000 K, 800 K and 600 K, respectively. The engine does 10 KW of net work and rejects 400 kJ/min of heat to a heat sink at 300 K. If the heat supplied by the reservoir at 1000 K is 60% of heat supplied by the reservoir at 600K. Find the quantity of heat supplied by each reservoirs. **(10 Marks)**

OR

6 a. Define entropy and prove that it is a point function. **(04 Marks)**

b. Discuss the Clausius Inequality. **(08 Marks)**

c. A steel ball mass of 10 kg at 627°C is dropped in 100 kg of oil at 30°C. The specific heat of steel and oil are 0.5 kJ/kgK and 3.5 kJ/kgK, respectively. Calculate the entropy change of steel, oil and the universe. **(08 Marks)**

Module-4

7 a. With neat sketch, explain available and Unavailable energy on T-S diagram. **(06 Marks)**

b. Explain the concept of second law of efficiency. **(06 Marks)**

c. A Carnot engine works between the temperature limits 225°C and 25°C in which water is used as the working fluid. If heat is supplied to the saturated liquid at 225°C, until it is converted into saturated vapour, determine per kg of water.
   (i) Amount of heat absorbed by the fluid
   (ii) Available energy
   (iii) Unavailable energy
(Take latent heat of water = 1858.5 kJ/kg) **(08 Marks)**

OR

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

b. A vessel of volume 0.04 m³ contains a mixture of saturated water and saturated state at a temperature of 250°C. The mass of the liquid present is 9 kg. Find the mass, specific volume, enthalpy, entropy and internal energy of the steam. **(10 Marks)**

Module-5

9 a. Define:
- (i)   Mole fraction
- (ii) Mass fraction
- (iii) Dalton's law
- (iv) Amgat's law of volume additives   (10 Marks)

   b. A mixture of gases contain 1 kg of CO_2 and 1.5 kg of N_2. The pressure and temperature of the mixture are 3.5 bar and 27°C. Determine:
- (i)   Mole fraction of each constituent
- (ii)   Partial pressure
- (iii) Partial volume
- (iv)   Volume of mixture
- (v)   Density of mixture   (10 Marks)

OR

10 a. State and explain the following terms:
- (i)   Compressibility factor
- (ii)   Reduced properties
- (iii) Real gases
- (iv)   Relative humidity   (08 Marks)

   b. With usual notations, write the Vandeer Waal equation and explain the terms involved in it.
                                                                           (04 Marks)

   c. Determine the pressure exerted by CO_2 in a container of 1.5 m³ capacity when it contains 5 kg at 27°C:
- (i) Using ideal gas relation
- (ii) Using Vandeer Waal's equation

   [Take a = 364.3 kPa (m³/kg.mol)²; b = 0.0427 (m³/kg.mol) for Vandeer Waal's constants]
                                                                           (08 Marks)

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CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐   **18ME34**

Third Semester B.E. Degree Examination, Dec.2019/Jan.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 the APF for BCC Unit cell.   **(07 Marks)**
    b.   Explain edge dislocation and screw dislocation.   **(08 Marks)**
    c.   State and explain Fick's 1st law of diffusion.   **(05 Marks)**

OR

2   a.   Define Stiffness , Yield strength , Toughness and Ultimate tensile strength.   **(08 Marks)**
    b.   Explain Plastic deformation by Slip and twinning.   **(06 Marks)**
    c.   Explain strain hardening and solid state hardening process of strengthening of metals.   **(06 Marks)**

Module-2

3   a.   Draw and explain the S – N curve.   **(04 Marks)**
    b.   Derive and expression for stress relaxation.   **(04 Marks)**
    c.   Draw the Iron carbon diagram indicating the phase temperatures. Explain the different phases in Iron carbon diagram.   **(12 Marks)**

OR

4   a.   State and explain Hume Rothery Rules.   **(06 Marks)**
    b.   Explain the effect of any 4 alloying elements in steel.   **(06 Marks)**
    c.   Two metals A & B are alloyed in the proportion of 60% A and 40% B. The melting temperature of A & B are 650^{0}C and 450^{0}C. When they are alloyed together they do not form any compound or intermediate phase, but form an Eutetic of composition 40% A and 60% B which solidifies at 300^{0}C. The maximum and minimum solid solubilities of B in A and A in B are 10% at 300^{0}C and remains constant till 0^{0}C. Assume solidus , liquidus and solves lines to be straight.
      i)   Draw the equilibrium diagram and label all the fields.
      ii)   The temperature at which solidification start and complete.
      iii)   Percentage of Eutectic at room temperature.   **(08 Marks)**

Module-3

5   a.   Define Heat treatment and give its classification.   **(06 Marks)**
    b.   Explain how a TTT diagram is drawn.   **(08 Marks)**
    c.   Explain Austempering and Martempering.   **(06 Marks)**

OR

6   a.   Draw the TTT diagram for Eutectoid steel and explain it.   **(07 Marks)**
    b.   With neat sketch, explain induction hardening process.   **(05 Marks)**
    c.   Explain the composition , properties and uses of Gray Cast Iron, White Cast Iron and SG Iron and Malleable Iron.   **(08 Marks)**

Module-4

7 a. Define Composite. Give its classification. (06 Marks)
   b. Explain metal matrix composites and ceramic matrix composites. (06 Marks)
   c. List the advantages, disadvantages and applications of composite materials. (08 Marks)

OR

8 a. Derive an expression for Young's modulus for ISO stress and ISO strain condition. (12 Marks)
   b. With neat sketch, explain Pultrusion process. (08 Marks)

Module-5

9 a. Define Ceramic. Explain the types of ceramics. (05 Marks)
   b. Differentiate between Thermoplastic and Thermosetting plastics. (05 Marks)
   c. With neat sketch, explain Processing of plastic by Injection Moulding method. (10 Marks)

OR

10 a. Explain the different Non – destructive testing methods used for accessing residual life. (10 Marks)
   b. Define Smart Material. Explain the types of smart materials. (10 Marks)

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USN | | | | | | | | | |　18ME35A/18MEA305

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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.　Name and explain with example the different types of chips formed during metal cutting. **(06 Marks)**

　b.　Draw Merchant's circle diagram and state the assumptions made in establishing the relationship among the various forces. **(08 Marks)**

　c.　During an orthogonal cutting process the following observations were made-chip thickness = 0.62mm feed 0.2 mm rake angle 15°. Calculate the chip reduction coefficient and shear angle. **(06 Marks)**

OR

2　a.　Differentiate between Turret lathe and Capstan lathe. **(06 Marks)**

　b.　Draw the tool layout for producing a hexagonal headed bolt on a capstan lathe from a hexagonal bar stock. Assume the dimensions. **(08 Marks)**

　c.　Write the functions of following lathe accessories :
　　(i) Live centre　　　(ii) Dead centre　　(iii) Steady rest　　(iv) Follower rest
　　(v) Dogs and face plates. **(06 Marks)**

Module-2

3　a.　With sketch write the comparison between up milling and down milling. **(06 Marks)**

　b.　Sketch and explain radial drilling machine highlighting its advantages and disadvantages. **(08 Marks)**

　c.　What is indexing? Name the different methods of indexing and explain compound indexing. **(06 Marks)**

OR

4　a.　Differentiate Shaper and Planer? **(06 Marks)**

　b.　With sketch explain the external centreless grinding highlighting the feed mechanism. **(08 Marks)**

　c.　How the shapers are classified? How a vertical shaper is different from slotter. **(06 Marks)**

Module-3

5　a.　Write a note on functions and types of cutting fluids used in metal cutting. **(06 Marks)**

　b.　Explain the various mechanisms responsible for different forms of tool wear. **(08 Marks)**

　c.　A cast iron plate of dimensions 450×150×60 mm, is to be rough shaped along its wider face. Calculate the machining time taking cutting speed = 10 mpm, return speed = 15 mpm, approach length = 30mm, over travel length = 30 mm, allowance on either side of the plate width = 6mm and feed per cycle = 15mm. **(06 Marks)**

OR

6 a. Which are the different forms of wear on the cutting edge of a tool? With appropriate sketch explain. **(06 Marks)**

   b. Explain the critical cutting parameters which effect the tool life. **(08 Marks)**

   c. The tool life for a HSS tool is expressed by the relation $VT^{1/7} = C_1$ and for Tungsten-Carbide $VT^{1/5} = C_2$. If the tool life for cutting speed of 24 mpm is 128 min, compare the life of the two tools at a speed of 30 mpm. **(06 Marks)**

Module-4

7 a. List the differences between cold working and hot working. **(06 Marks)**

   b. What is forging? Explain the working of board hammer with sketch. **(08 Marks)**

   c. With sketch explain : (i) Two high rolling mill (ii) Planetary rolling mill. **(06 Marks)**

OR

8 a. How the extrusion process is classified? Write a note on the difference between direct and indirect extrusion. **(06 Marks)**

   b. With neat sketch explain the wire drawing process. **(08 Marks)**

   c. Explain the defects in extruded products. **(06 Marks)**

Module-5

9 a. With a neat sketch explain V-bending and edge bending operations. **(06 Marks)**

   b. What do you mean by dies? Write brief note on (i) Progressive dies (ii) Combination dies. **(08 Marks)**

   c. With neat sketch explain shearing of sheet metal. **(06 Marks)**

OR

10 a. What is stripper? With neat sketch explain fixed plate stripper. **(06 Marks)**

    b. With a neat labeled sketch explain the parts of open back inclinable press. **(08 Marks)**

    c. Calculate the bending force for the 90° bend part from the steel sheet with air bending. The bend length is 30 cm, the material thickness is 2.5 mm and beam length is 25mm. The tensile strength of the material is 32 kN/cm^2. Die opening factor = 1.33. **(06 Marks)**

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18MATDIP31

Third Semester B.E. Degree Examination, Dec.2019/Jan.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. Express the following complex number in the form of $x+iy : \dfrac{(1+i)(1+3i)}{1+5i}$. **(06 Marks)**

   b. Prove that $\left(\dfrac{\cos\theta+i\sin\theta}{\sin\theta+i\cos\theta}\right)^{4}=\cos 8\theta+i\sin 8\theta$. **(07 Marks)**

   c. If $\vec{a}=(3,-1,4)$, $\vec{b}=(1,2,3)$ and $\vec{c}=(4,2,-1)$, find $\vec{a}\times\left(\vec{b}\times\vec{c}\right)$. **(07 Marks)**

OR

2 a. Find the angle between the vectors, $\vec{a}=5\hat{i}-\hat{j}+\hat{k}$ and $\vec{b}=2\hat{i}-3\hat{j}+6\hat{k}$. **(06 Marks)**

   b. Prove 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)**

   c. Find the fourth roots of $-1+i\sqrt{3}$ and represent them on the argand diagram. **(07 Marks)**

Module-2

3 a. Obtain the Maclaurin's expansion of $\log_{e}(1+x)$. **(06 Marks)**

   b. If $u=\sin^{-1}\left[\dfrac{x^{3}+y^{3}}{x+y}\right]$, prove that $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}=2\tan u$. **(07 Marks)**

   c. If $u=x(1-y)$, $v=xy$, find $\dfrac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

OR

4 a. Obtain the Maclauvin's series expansion of the function $\log_{e}\sec x$. **(06 Marks)**

   b. If $u=x^{2}-2y$; $v=x+y$ find $\dfrac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

   c. If $u=f(x-y,y-z,z-x)$, prove that $\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}+\dfrac{\partial u}{\partial z}=0$. **(07 Marks)**

Module-3

5 a. Find the velocity and acceleration of a particle moves along the curve, $\vec{r}=e^{-2t}\hat{i}+2\cos 5t\hat{j}+5\sin 2t\hat{k}$ at any time t. **(06 Marks)**

   b. Find $\operatorname{div}\vec{F}$ and $\operatorname{curl}\vec{F}$, where $\vec{F}=\nabla\left(x^{3}+y^{3}+z^{3}-3xyz\right)$. **(07 Marks)**

   c. Show that $\vec{F}=(2xy+z^{2})\hat{i}+(x^{2}+2yz)\hat{j}+(y^{2}+2xz)\hat{k}$ is conservative force field and find the scalar potential. **(07 Marks)**

OR

6 a. Show that the vector field, $\vec{F} = (3x + 3y + 4z)\hat{i} + (x - 2y + 3z)\hat{j} + (3x + 2y - z)\hat{k}$ is solenoidal. **(06 Marks)**

b. Find the directional derivative of $\phi = \dfrac{xz}{x^2 + y^2}$ at $(1, -1, 1)$ in the direction of $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$. **(07 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. **(07 Marks)**

Module-4

7 a. Find the reduction formula for $\displaystyle\int_0^{\frac{\pi}{2}} \sin^n x \, dx$. **(06 Marks)**

b. Evaluate $\displaystyle\int_0^1 \int_0^3 x^3 y^3 \, dx \, dy$. **(07 Marks)**

c. Evaluate $\displaystyle\int_0^3 \int_0^2 \int_0^1 (x + y + z) \, dz \, dx \, dy$. **(07 Marks)**

OR

8 a. Evaluate : $\displaystyle\int_0^{\frac{\pi}{6}} \sin^6(3x) \, dx$. **(06 Marks)**

b. Evaluate : $\displaystyle\int_0^1 \int_x^{\sqrt{x}} xy \, dy \, dx$. **(07 Marks)**

c. Evaluate : $\displaystyle\int_0^1 \int_0^{1-x} \int_0^{1-x-y} xyz \, dz \, dy \, dx$. **(07 Marks)**

Module-5

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

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

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

OR

10 a. Solve : $(5x^4 + 3x^2y^2 - 2xy^3) dx + (2x^3y - 3x^2y^2 - 5y^4) dy = 0$. **(06 Marks)**

b. Solve : $\dfrac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$. **(07 Marks)**

c. Solve : $[1 + (x + y) \tan y] \dfrac{dy}{dx} + 1 = 0$. **(07 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Constitution of India and 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. Who appoints Lieutenant Governor General to Delhi
   a) PM   b) Law Minister   c) President   d) Vice - President

2. Who acts as a President when neither the President not the Vice – President is available
   a) Speaker of Lok Sabha   b) Attorney General of India
   c) Chief Justice of India   d) Speaker of Rajya Sabha

3. How many judges are there in the SC including Chief Justice of India?
   a) 15   b) 19   c) 25   d) 31

4. The Parliamentary system of the Indian Constitution is borrowed from
   a) Britain Constitution   b) Objective Constitution
   c) Canada Constitution   d) Australian Constitution

5. The final interpreter to the Indian Constitution is
   a) Speaker of LS   b) Parliament   c) President   d) Supreme Court

6. The person arrested has to be produced before Magistrate within
   a) 1 week   b) 24 hours   c) 72 hours   d) 2 months

7. Which is the language to be used in Parliament
   a) Kannada   b) Hindi   c) English   d) Both (b) & (c)

8. President made Proclamation of emergency on the grounds of internal disturbance for first time in
   a) 1975   b) 1965   c) 1962   d) 1950

9. Who will impeach Chief Election Commissioner of India
   a) President
   b) Vice President
   c) Prime Minister
   d) By 2/3rd majority of Parliament

10. Which is the highest Court of the Country
    a) High Court   b) Supreme Court   c) District Court   d) CET

11. India has
    a) Democracy
    b) Presidental system
    c) Direct Democracy
    d) Parliamentary Democracy

12. What is the punishment given , if computer source documents are tampered
    a) Imprisonment of 2 years with fine of Rs 2 lakhs
    b) Imprisonment of 3 years with fine of Rs 2 lakhs
    c) Imprisonment of 4 years with fine of Rs 2 lakhs
    d) Imprisonment of 5 years with fine of Rs 2 lakhs

13. What is the punishment given , if computer has been hacked under Section 43
    a) Imprisonment of 1 year with fine upto Rs 2 lakhs
    b) Imprisonment of 3 years with fine upto Rs 5 lakhs
    c) Imprisonment of 3 years with fine upto Rs 4 lakhs
    d) Imprisonment of 4 years with fine upto Rs 5 lakhs

14. Who appoints Prime Minister
    a) The President of India
    b) Lok Sabha
    c) The majority party is Lok Sabha
    d) Rajya Sabha

15. How much time was taken for framing Constitution?
    a) 2 years 11 months and 18 days
    b) 13 years 11 months and 18 days
    c) 4 years 11 months and 18 days
    d) 1 year 11 months and 18 days

16. The President of India is
    a) The real ruler of India
    b) Head of the Government
    c) Constitution Head of Country
    d) Head of the State

17. Which of the State has highest members in Lok Sabha
    a) Andra Pradesh   b) Uttar Pradesh   c) Madhya Pradesh   d) Karnataka

18. The Council of Ministers and Prime Minister shall not exceed total strength of the LokSabha
    a) 5 %   b) 10 %   c) 12 %   d) 15 %

19. The total number of seats in Legislative Assembly of Karnataka is
    a) 200   b) 224   c) 240   d) 250

20. The basic feature of the Indian Constitution is found in
    a) Fundamental duties
    b) Fundamental Rights
    c) Preamble
    d) Directive Principle of State Policy

21. To became a Judge of High Court, one must be practicing Advocate of High Court for a period of atleast _____ years
    a) 20   b) 10   c) 15   d) 5

22. The Constitution empowers State Government to make Special Law for
    a) Workers   b) Teachers   c) Women & Children   d) Farmers

23. Directive principles come under _____ of the Constitution
    a) Part - II   b) Part - III   c) Part - IV   d) Part – I

24. The system of Legislature in the State of Karnataka is
    a) Bicameral   b) Unicameral   c) Cameral   d) Multi cameral

25. The Mandal Commission, was Constituted relating to
    a) Reservation of SCs   b) Reservation to STs
    c) Reservation   d) Reservation to Backward classes

26. Who is appointing Chief Election Commissioner?
    a) Prime Minister   b) Law Minister   c) President   d) Vice - President

27. Who is the Ex – Officio Chairman of Rajya Sabha?
    a) President   b) Vice - President   c) Prime Minister   d) Governor

28. Vice – President of India is elected
    a) By the people
    b) By the members of State Legislature Assembly
    c) By the members of Rajya Sabha
    d) By the members of both the houses of Parliament at a joint sitting.

29. Which Amendment deals with the establishment of Municipalities a part of Constitution system?
    a) 44th   b) 74th   c) 76th   d) 86th

30. Who appoints the Governor of the State?
    a) Chief Justice of India   b) Chief Justice of State
    c) Chief Minister   d) President

31. When the Indian Constitution enacted and adopted?
    a) 26/10/1949   b) 26/12/1949   c) 26/11/1949   d) 26/01/1949

32. When the Indian Constitution gives effect
    a) 26/10/1949   b) 26/12/1949   c) 26/01/1950   d) 26/01/1949

33. Which of the following word was added in the Preamble of the Constitution by 42nd Amendment Act 1976
    a) Socialist   b) Sovereign   c) Federal   d) Republic

34. The President power to suspend death sentence temporarily is called
    a) Respite   b) Reprieve   c) Remission   d) Constitution

35. The Preamble of the Constitution has been amended so far
    a) 4 times   b) 3 times   c) twice   d) Once

36. Who are not entitled to form Union
    a) Students   b) Police   c) Teachers   d) Entrepreneurs

37. Which is not a Fundamental Right
    a) Right against exploitation   b) Right to freedom of religion
    c) Right to strike   d) Right to equality

38. Which of the following is not one of the 3 organs of state / Union
    a) Executive   b) Press   c) Judiciary   d) Legislation

39. How many Anglo Indians and others can be nominated by the President to the Lok Sabha and Rajyasabha
    a) 2 & 12   b) 2 & 10   c) 1 & 12   d) 1 & 10

40. Which state Constitution has removed by the Parliament of India?
    a) West Bengal   b) Nagaland   c) Sikkim   d) Jammu & Kashmir

41. When the office of the President falls vacant , the same must be filled up within
    a) 4 months   b) 6 months   c) 12 months   d) 18 months

42. The Preamble of the Constitution indicates
    a) Power to make laws
    b) The sovereign of Indian Constitution
    c) Power of Parliament to amend the Constitution
    d) Sources of Constitution.

43. Which important human right is protected under Article 21
    a) Right to Equality   b) Right to life and liberty
    c) Right to freedom of speech   d) Right to religion

44. Right to Equality is guaranteed under Article
    a) 13   b) 15   c) 16   d) 14

45. No person shall be punished for same offence more than once
    a) Jeopardy   b) Double Jeopardy
    c) Ex-post facto law   d) Testimonial compulsion

46. The Rajya Sabha
    a) Is a Permanent House   b) Has a life of 6 years
    c) Has a life of 5 years   d) Has a life of 7 years

47. The Quorum or minimum number of members required to hold the meetings of either houses of the Parliament is
    a) One - tenth   b) One - fifth   c) One - third   d) One - fourth

48. The Advice of Supreme Court is
    a) Binding on the President
    b) Not binding on the President
    c) Binding on the President if it is tendered unanimously
    d) None of these

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49. Article 19 provides
    a) 6 freedoms   b) 7 freedoms   c) 8 freedoms   d) 5 freedoms

50. Who is the present speaker of Lok Sabha
    a) Sumithra Mahajan   b) K.S Hegde   c) Om Birla   d) Venkiah Naidu

51. Which is the landmark Judgement passed by the Supreme Court in respect to Preamble of Constitution
    a) Beur beri   b) Keshavananda Bharathi
    c) Menaka Gandhi   d) Sonia Gandhi

52. Who is the neutral person in the affairs of party politics
    a) C.M   b) Home Minister   c) Finance Minister   d) Speaker

53. Indian Constitution guarantees reservation of seats to SC & ST in
    a) Lok Sabha and Assembly   b) Lok Sabha only
    c) Lok Sabha and Rajya Sabha   d) Rajya Sabha

54. Who will preside over the joint session of both the houses of the Parliament
    a) President   b) Prime Minister   c) Speaker   d) Law Minister

55. What is the minimum age for becoming M.P in Rajya Sabha and Lok Sabha
    a) 18 and 25   b) 25 and 18   c) 25 and 30   d) 30 and 25

56. India is referred to as _____ under the Indian Constitution
    a) Country   b) Hindustan   c) India   d) Bharat

57. The citizens can enforce their Fundamental Rights before SC under
    a) Article 31   b) Article 32   c) Article 33   d) Article 34

58. Who quoted "Child of Today is Citizen of Tomorrow"?
    a) L. Tilak   b) Jawaharlal Nehru   c) B.R. Ambedkar   d) Gandhiji

59. What is the minimum age required for casting of Vote
    a) 18   b) 19   c) 20   d) 21

60. Who quoted "Freedom is my birth right"?
    a) L. Tilak   b) Jawaharlal Nehru   c) Sardar Patel   d) Gandhiji

61. Salaries and other emoluments of the High Court Judges shall be determined by the
    a) Governor   b) Parliament   c) Chief Minister   d) State Legislature

62. According to 74th Amendment Act of 1993, which subject has been incorporated?
    a) Municipalities   b) Co-operative Society
    c) Gram Panchayat   d) Taluk Panchayat

63. IP Sec is designed to withstand replay attacks through the use of
    a) Sequence numbers   b) Nonces
    c) Nonces + Sequence numbers   d) Timestamps

64. The Key Confirmation Key [KCK] is used to
a) Integrity – protect data between the station and the AP
b) Integrity – protect messages in the four – way hand shake
c) Encrypt data between the station and the AP
d) Encrypt the message containing the group key.

65. Which of the following is true in a Smurf Attack?
a) The Victim receives large number of UDP packers to non – listening ports
b) The Victim receives large number of TCP SYN – ACK packers
c) The Victim receives large number of ICMP "Echo Request" messages
d) The Victim receives large number of ICMP "Echo Reply" messages.

66. A persistent cross – site scripting attack saves malicious code on
a) The client   b) The server   c) Both client & server   d) Neither (a) & (b)

67. The possible goal of an attacker is sending packets with invalid combinations of TCP header flag is to
a) Launch a SYN flood attack   b) Find which services are open
c) Perform OS finger printing
d) Determine the addressing schema within an organisation

68. The SOAP binding refers to
a) The object bound to a SOAP message   b) The XML schema of a SOAP message
c) The mapping between a SOAP message underlying transport protocol
d) The headers in a SOAP message

69. The EKE protocol is resistant to
a) Replay attacks   b) Man – in – the middle attacks
c) Dictionary attacks   d) Reflection attacks

70. The SIM authenticates itself to the MSC/HLR using
a) A user password   b) A digital certificate
c) A response to a challenge   d) An encrypted signaling message.

71. One of the salient features of our constitution in
a) It is fully rigid   b) It is fully flexible
c) It is partly rigid and partly flexible   d) None of these

72. A person to be appointed as a Governor of a State must have completed the age of
a) 30 years   b) 35 years   c) 45 years   d) 50 years

73. The Chief Election Commission holds office for a period of
a) 3 years   b) 6 years
c) 5 years   d) 6 years or till he attains age of 65 years

74. The procedure for amending the constitution is detailed under
a) Article 360   b) Article 368   c) Article 352   d) Article 301

75. Writ of Mandamus can be issued on the ground of
a) Non – performance of public duties   b) Unlawful Detention
c) Unlawful occupation of public office   d) None of these

76. Who acted as the Chairman of the drafting committee of the Constitution of India?
    a) Dr. B.R. Ambedkar
    b) B.C. Rajgopalanchari
    c) Dr. Rajendra Prasad
    d) Jawaharlal Nehru

77. Engineering Ethics is
    a) A macro Ethics
    b) Business Ethics
    c) A developing Ethics
    d) A code of Scientific rules based on Ethics

78. The use of intellectual property of others without permission or credit is referred as
    a) Cooking
    b) Stealing
    c) Plagiarism
    d) Trimming.

79. Who is the chair person of Parliament
    a) CM
    b) PM
    c) FM
    d) Speaker

80. Who will impeach the Chief Justice of India
    a) Supreme Court
    b) Law Minister
    c) 2/3rd Majority of Parliament
    d) By Rajya Sabha

81. Uniform Civil code means
    a) A code related to individuals public life
    b) A code meant for Hindu only
    c) A Civil procedure code
    d) A Codified Law applicable to all person of India irrespective of their religion

82. The Vice – President has power
    a) To sign bills passed by Rajya Sabha
    b) To preside over Rajya Sabha
    c) To nominate two members for Rajya Sabha
    d) To propagate ordinance

83. Parliament of India consists of
    a) Lok Sabha
    b) Lok Sabha & Rajya Sabha
    c) Only Rajya Sabha
    d) None of these

84. A National emergency can remain in operation with the approval of Parliament for
    a) An indefinite period
    b) A maximum period of 6 months
    c) A maximum period of 1 year
    d) A maximum period of 3 years

85. In Engineering research and testing, retaining the contradictory statement, discarding the rest is called
    a) Trimming
    b) Scanning
    c) Cooking
    d) Skimming

86. The Chief Justice and other Judges of High Court are appointed by
    a) President
    b) Chief Minister
    c) Prime Minister
    d) Governor

87. The terms 'Ethics' is derived from
    a) Ethical in English
    b) Ethic in Latin
    c) Custom
    d) Ethicos in Greek

88. The aim of the Directive Principles of State Policy is to establish
    a) Capitalist State in Our Country
    b) Communist State in Our Country
    c) Welfare State in the Country
    d) All of these

89. Special majority means more than
    a) 50% majority
    b) Two – third majority
    c) 75% majority
    d) 60 – majority

90. One way of misusing the truth is
    a) Exaggerating the truth
    b) Making wrong statement
    c) Making confused statement
    d) Failure to seek out the truth

91. The Chief Justice of High – Court is appointed by
    a) President
    b) Chief Minister
    c) Prime Minister
    d) Governor

92. Which is Not a Fundamental right
    a) Right to freedom
    b) Right to Constitutional remedy
    c) Right to property
    d) Right to equality

93. The tenure of Vice – President
    a) 2 years
    b) 5 years
    c) 3 years
    d) 1 year

94. How many Schedules are there in Indian Constitution?
    a) 7
    b) 5
    c) 12
    d) 6

95. The membership of Legislative Assembly of State varies between
    a) 60 & 500
    b) 100 & 300
    c) 150 & 450
    d) 100 & 400

96. According to Indian Constitution, the power of amending the Constitution is vested with
    a) Parliament
    b) President
    c) People
    d) The Prime Minister of India

97. Engineers can use code of ethics as guidelines to
    a) Resolve the conflicts
    b) Formulate the problem
    c) Shift of Responsibility
    d) Overcome the work pressure

98. What is the maximum strength of Lok Sabha
    a) 500
    b) 545
    c) 552
    d) 550

99. Union list has
    a) 95 subjects
    b) 97 subjects
    c) 105 subjects
    d) 66 subjects

100. The Fundamental Rights of Indian citizen are contained in
    a) Part – III of Constitution
    b) Part – IV of Constitution
    c) The 7th Schedule of Constitution
    d) None of these

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