

Total No. of printed pages = 3

HS 181105

Roll No. of candidate

2	0	0	6	1	0	0	0	3	0	7	8
---	---	---	---	---	---	---	---	---	---	---	---

2021

B.Tech. 1st Semester End-Term Examination

SOCIOLOGY

(New Regulation) (w.e.f. 2017 – 18)

New Syllabus (Group – B) (w.e.f. 2018 – 19)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following by choosing the correct option : $(10 \times 1 = 10)$

(i) Who said that sociology is the study of interaction of human minds?

- (a) Hobhouse
- (b) Max Weber
- (c) August Comte

(ii) Which of the following is not a feature of society?

- (a) Society is not always changing
- (b) Society is the web of social relationship
- (c) Society is the system of controls of human behavior

(iii) Extended family means

- (a) At least three generations living together
- (b) One big family sharing a common descent
- (c) Husband and wife and their children live together

[Turn over

- (iv) Which of the following is a feature of culture?
- (a) Culture is acquired
- (b) Culture has no adaptive qualities
- (c) Culture does not transmit from generation to generation.
- (v) Which of the following is not a feature of social order in rural areas?
- (a) The social structure in villages tends to follow a more traditional pattern
- (b) The subordinate sections of society have much more scope for expressing themselves in rural areas
- (c) The relative power of the dominant sections is much more because they control most avenues of employment in rural area
- (vi) Who said that social change is change in the relation?
- (a) MacIver
- (b) Davis
- (c) Merrill and Eldredge
- (vii) The term labour turnover measures
- (a) The extent to which the workers fail to attend their regular duty
- (b) The personnel of workers in an undertaking
- (c) The rate of change in the working staff during a particular period of time
- (viii) Industrial dispute is the product of
- (a) Large -scale industry
- (b) Small- scale industry
- (c) Cottage industry
- (ix) Productivity can be defined as the ratio of
- (a) Output of production to the input of factor
- (b) Output of production to the number of man-hours worked
- (c) Output of production to the number of capital-hours worked
- (x) Which of the following is the oldest trade union organization in India?
- (a) AITUC
- (b) ICFTU
- (c) ITU

2. (a) Define sociology. Discuss the nature of sociology. (2 + 6 = 8)
- (b) Examine the importance of the study of sociology in the present world. (7)
3. (a) Describe the factors that have undermined the traditional family. (7)
- (b) Compare the structure and functions of the traditional and modern family. (4 + 4 = 8)
4. (a) What is caste? Explain the various features of the Indian caste system. (2 + 6 = 8)
- (b) Distinguish between class and caste. What are the criteria of class distinctions? (4 + 3 = 7)
5. (a) What is industrial disputes? Explain five non-economic causes of industrial disputes. (3 + 5 = 8)
- (b) Discuss how industrial disputes can be solved with the help of arbitration method. (7)
6. (a) What is workers participation in management? Explain various pre-conditions to succeed workers participation in management. (2 + 5 = 7)
- (b) Discuss the various types of workers participation in management. (8)
7. (a) Define human resources. Explain the various shortcomings of human resources and give suggestions to remove them. (2 + 5 + 3 = 10)
- (b) Write the compositions of human investment to create and develop human resources in the society. (5)
8. Write short notes on any three of the following : (5 + 5 + 5 = 15)
- (a) Gender discrimination 8 - 4
- (b) Lay- off and retrenchment 15 - 8
- (c) Unemployment problem and its solutions. 8 - 4
- (d) Folkways and mores 5 - 3
- 10 - 6
- 7 - 3
- 53 - 28

Total No. of printed pages = 3

CE 181103

Roll No. of candidate

2	0	0	6	1	0	0	0	3	0	7	8
---	---	---	---	---	---	---	---	---	---	---	---

2021

B.Tech. 1st Semester End-Term Examination
ENGINEERING GRAPHICS AND DESIGN
(New Regulation w.e.f. 2017-18)
(New Syllabus – (Group-B) w.e.f. 2018-19)

Full Marks – 70

Time – Four hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

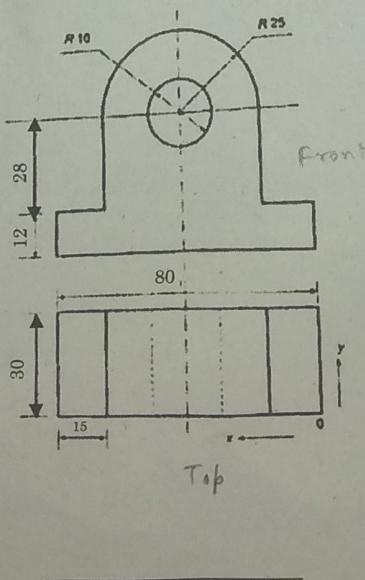
1. Answer the following : $(10 \times 1 = 10)$

- (i) A diagonal scale is used when measurements are required in
 - (a) One unit
 - (b) Two unit
 - (c) Three units
 - (d) None of above
- (ii) The eccentricity of the conic section is defined as
 - (a) Distance of the point from the focus/distance of point from directrix
 - (b) Distance of point from directrix/distance of point from focus
 - (c) Distance of point from tangent/distance of point from focus
 - (d) Distance of point from vertex/distance of point from focus
- (iii) The curves generated by a fixed point on the circumference of the a circle, which rolls without slipping along a fixed straight line or a circle is called
 - (a) Cycloid
 - (b) Trochoid
 - (c) Hypocycloid
 - (d) Epicycloid

[Turn over

- (iv) The front view is above XY and top view is below XY, the projection is
- First angle projection
 - Second angle projection
 - Third angle projection
 - Fourth angle projection
- (v) The true length of line can be determined when the line is
- Perpendicular to a plane
 - Parallel to a plane
 - Inclined to a plane
 - None of above
- (vi) In AUTOCAD polyline is combination of lines made from
- Series of individual lines
 - Straight line
 - Curve
 - Point
- (vii) In AUTOCAD, the relative coordinate is the coordinate of next point of line given with reference to
- first point
 - previous point
 - origin
 - none of above
- (viii) In AUTOCAD drawing, Circle can be drawn using
- Center point and radius
 - Three points given on circumferences
 - Tangent, tangent and radius method
 - All of above
- (ix) To draw area bounded by equal, straight lines
- Polygon command is used
 - Rectangle command is used
 - Square command is used
 - Circle command is used
- (x) Mirror command is used to
- Draw a similar object to other half
 - Copy a object
 - Erase a object
 - None of above

2. (a) Write freehand in single-stroke capital letters of 12 mm height, the following sentence:
 "HIDDEN EDGES ARE SHOWN BY DASHED LINE" (7)
- (b) Draw a vernier scale of R.F=1/40 to read upto 4 m and show lengths representing 2.39 m and 0.91m. (8)
3. (a) Construct a parabola when the distance of the focus from directrix is 50mm. (7)
- (b) A line AB, 65 m long, has its end A 20 mm above the HP and 25 m in front of the VP. The end B is 40 mm above the HP and 65 mm in front of the VP. Draw the proection of AB abd show its inclinations with the HP and the VP. (8)
4. (a) A regular pentagon of 25 m has one side on the ground. Its plane is inclined at 45° to the HP and perpendicular to the VP. Draw the projections. (7)
- (b) A hexagonal pyramid, base 25 mm side and axis 50 mm long, has an edge of its base on the ground. Its axis is inclined at 30° to the ground and parallel to V.P. Draw its projection. (8)
5. Draw the projections of a circle of 50 mm diameter resting in the HP on a point A on the circumferences, its plane inclined 45° to the HP and the top view of the diameter AB making 30° angle with the VP. (15)
6. A square pyramid, base 40 m side and axis 65 mm long, has its base in the VP. One edge of the base is inclined at 30° to the HP. Draw its projections. (15)
7. Draw isometric view of model, two views are shown below. (15)



Total No. of printed pages = 4

PH 181101

Roll No. of candidate

2	0	0	6	1	0	0	0	3	0	7	8
---	---	---	---	---	---	---	---	---	---	---	---

2021

B.Tech. 1st Semester End-Term Examination

PHYSICS – 101

(New Regulation w.e.f. 2017-18) and

(New Syllabus – (Group-B) (w.e.f. 2018-19))

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer question No. 1 and any *four* from the rest.

1. Write the correct answer from MCQ: (10 × 1 = 10)

- (i) If curl of a vector point function is zero then the vector is
 - (a) Rotational
 - (b) Irrotational
 - (c) Both rotational
 - (d) Solenoidal
- (ii) Displacement current exist whenever there is a
 - (a) change of electric flux
 - (b) steady condition
 - (c) external magnetic field
 - (d) none of above
- (iii) To obtain interference, we need two sources which emit radiation
 - (a) the two sources should be coherent
 - (b) the two source must emit continuous waves of the same wavelength and time period
 - (c) both (a) and (b)
 - (d) none of above

[Turn over

- (iv) Laser light is produced due to
- (a) Interference of light
 - (b) Spontaneous emission of light
 - (c) Light amplification by stimulated emission of radiation
 - (d) Diffraction phenomenon
- (v) Ratio of probability of spontaneous emission and probability of stimulated emission is proportional to
- (a) v^2
 - (b) v^3
 - (c) v
 - (d) independent of v
- (vi) Which of the following is true for if n_1 is refractive index of core glass and n_2 is refractive index of clad glass then
- (a) $n_1 < n_2$
 - (b) $n_1 = n_2$
 - (c) $n_1 > n_2$
 - (d) n_1 and n_2 can have any value
- (vii) The Davisson and Garner experiment relates to
- (a) Polarization
 - (b) Interference
 - (c) Electron diffraction
 - (d) Phosphorescence
- (viii) The product of wave function ψ and its complex conjugate ψ^* is known as
- (a) Probability density
 - (b) Charge density
 - (c) Mass density
 - (d) Current density
- (ix) The correct expression for mobility of electron is
- (a) $\mu = v_d E$
 - (b) $\mu = v_d^2 E$
 - (c) $\mu = \frac{v_d}{E}$
 - (d) $\mu = \frac{v_d}{E^2}$

- (x) When superconductor is placed in a magnetic field at critical temperature then the induced current flow in the super conductor such that it opposed the field and eject lines of force _____
- Inside the superconductor
 - Outside the superconductor
 - Towards the superconductor
 - None of above
2. (a) What do you mean by gradient of a scalar field? Find the gradient of a scalar function $\phi = 5xy - 3y^2z^3$ at the point $(-1, 2, -2)$. (1+3)
- (b) State the Maxwell's equations in differential form and write their physical significance. (2+4)
- (c) Compare hard and soft magnetic material with examples. (5)
3. (a) In interference due to reflected light in plane parallel film, find the effective path difference between the interfering reflected rays. Hence write the conditions for constructive and destructive interference. (6+2)
- (b) The dispersive powers of a crown and flint glass are 0.02 and 0.04 respectively. Find the focal length of the component lens of an achromatic doublet of focal length 20 cm. (4)
- (c) The central part in Newton's ring seen in reflected rays appears dark. Why? The interference fringes produced in the Newton ring experiment are real or virtual. (2+1)
4. (a) What do you mean by metastable state? Why existence of metastable state is an essential requirement for achieving population inversion? (2+2)
- (b) What is population inversion and why it is sometimes referred to as negative temperature state? (2+1)
- (c) Determine the condition under which stimulated emission equal to spontaneous emission. (4)
- (d) What is holography? What is the difference between holography and photography? (2+2)
5. (a) What is phase velocity? Show that the group velocity associated with a wave packet is equal to the velocity of the particle. (2+3)
- (b) What is wave function? Derive the one dimensional time dependent Schrodinger's wave equation for non relativistic particle. (2+5)
- (c) Evaluate de Broglie's wave length of helium nucleus that accelerate through 500 V.
- (Given mass of proton = mass of neutron = $\times 1.67 \times 10^{-27}$ kg). (3)

6. (a) Derive an expression for electrical conductivity of a conductor based on classical free electron theory. (5)
- (b) What is Hall Effect? Show that Hall coefficient is independent of the applied magnetic field and is inversely proportional to the current density and electric charge. (2+3)
- (c) Discuss the propagation mechanisms of light waves in optical fibre. What are single mode, multimode, and graded index fibre? (2+3)
7. (a) Write about the phenomenon of superconductivity and explain the behaviour of superconductor in an external magnetic field. How does it behave in a different manner compared to normal conductor? (2+4+4)
- (b) The critical temperature for lead is 7.2K. It loses its superconductive state at 5K, when it is placed in an external magnetic field of strength 3.3×10^4 A/m. Determine the corresponding value of field strength at 0K. (5)
-

Total No. of printed pages = 4

MA 181102

Roll No. of candidate

2	0	0	6	1	0	0	0	3	0	7	8
---	---	---	---	---	---	---	---	---	---	---	---

2021

B.Tech. 1st Semester End-Term Examination

MATHEMATICS-I

New Regulation (w.e.f 2017-18)

New Syllabus – Group A (w.e.f. 2018-19)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the appropriate answer :

(10 × 1 = 10)

(i) The value of $\int_0^{\frac{\pi}{2}} \cos^6 x dx$ is equal to

(a) $\frac{15}{96}\pi$

(b) $\frac{96}{15}\pi$

(c) $\frac{1}{96}\pi$

(d) 15π

(ii) The total volume of the solid of revolution generated by the curve $y = f(x)$ bounded between $x = x_0$ and $x = x_1$ is

(a) $\int_{x_0}^{x_1} x^2 dx$

(b) $\int_{x_0}^{x_1} x^2 dy$

(c) $\int_{x_0}^{x_1} y^2 dx$

(d) $\pi \int_{x_0}^{x_1} y^2 dx$

(iii) $\beta\left(\frac{1}{2}, \frac{1}{2}\right)$ is equal to

(a) $\frac{\pi}{2}$

(b) π

(c) $-\pi$

(d) 0

[Turn over

(iv) If $y = \log x$ then n^{th} derivative of y is

(a) $\frac{(-1)^n n!}{x^n}$

(b) $\frac{(-1)^{n-1} (n-1)!}{x^n}$

(c) $\frac{(-1)^n (n-1)!}{x^{n-1}}$

(d) None of these

(v) $f(x, y) = \frac{x+y}{\sqrt{x} + \sqrt{y}}$ is a homogeneous function of degree

(a) 1

(b) $\frac{1}{2}$

(c) 2

(d) None of the above

(vi) If $f(x, y) = 0$ then $\frac{dy}{dx}$ is equal to

(a) $\frac{\frac{\partial f}{\partial x}}{\frac{\partial f}{\partial y}}$

(b) $-\frac{\frac{\partial f}{\partial x}}{\frac{\partial f}{\partial y}}$

(c) $\frac{\frac{\partial f}{\partial y}}{\frac{\partial f}{\partial x}}$

(d) $-\frac{\frac{\partial f}{\partial y}}{\frac{\partial f}{\partial x}}$

(vii) $\int_a^b \int_c^d \int_e^f dz dy dx$ is equal to

(a) $a+b+c+d+e+f$

(b) $(b-a)(d-c)(f-e)$

(c) $abcdef$

(d) $(a+b)(c+d)(e+f)$

(viii) If A is a non-singular $n \times n$ matrix then

(a) $\rho(A) = 0$

(b) $\rho(A) = n$

(c) $\rho(A) = -n$

(d) None of these

(ix) If λ be an eigen value of a matrix A then λ^{-1} is an eigen value of

(a) A

(b) $\frac{|A|}{\lambda}$

(c) A^{-1}

(d) $\frac{\lambda}{|A|}$

(x) A system of homogeneous linear equation $AX = 0$ is always

(a) Consistent

(b) Inconsistent

(c) Has a unique solution

(d) Has an infinite number of solutions

2. (a) Find the reduction formula for $\int \sin^n x dx$. (5)

(b) If the cardioid $r = a(1 - \cos \theta)$ is rotated about the initial line, find the area of the solid of revolution generated. (5)

(c) Evaluate $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$. (5)

3. (a) Find y_n if $y = x^2 e^{ax}$. (3)

(b) If $y = \cos(\log x)$ prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2 - 1)y_n = 0$. (5)

(c) Evaluate any one (3)

(i) $\lim_{x \rightarrow 0} \frac{\tan x - x}{x - \sin x}$

(ii) $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} \right)^{\tan x}$

(d) Find the radius of curvature of the cycloid (4)

$x = a(\theta + \sin \theta)$

$y = a(1 - \cos \theta)$ at the point θ . *4a \cos \theta/2*

4. (a) Find the Fourier series for the function $f(x) = x^2$, $-\pi \leq x \leq \pi$. Hence show

that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + \dots = \frac{\pi^2}{6}$ (6+2=8)

(b) Discuss the convergence of the series $\sum_{n=0}^{\infty} \left(1 + \frac{1}{n} \right)^{-n^2}$. (3)

(c) If $u = x^y$, show that $\frac{\partial^3 u}{\partial x^2 \partial y} = \frac{\partial^3 u}{\partial x \partial y \partial z}$. (4)

5. (a) If $u = f(r)$, where $r = x^2 + y^2$, prove that $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f''(r) + \frac{1}{r} f'(r)$. (5)

(b) If $u = f(y-z, z-x, x-y)$, prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$. (5)

(c) Expand $f(x) = x$ in a half range sine series in $0 < x < 2$. (3)

(d) If A is an orthogonal matrix prove $|A| = \pm 1$. (2)

6. (a) Prove that the inverse of an orthogonal matrix is orthogonal and its transpose is also orthogonal. (2+2=4)

(b) Find the inverse of $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$ by using elementary row transformations. (4)

(c) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$. (4)

- (d) If $u = x\varphi(y/x) + \psi(y/x)$ show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = x\varphi(y/x)$. (3)

7. (a) Examine for minimum and maximum values: $\sin x + \sin y + \sin(x+y)$. (5)

(b) Evaluate $\iint_R y dx dy$, where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$. (5)

(c) Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$. (5)

(6, 1) (2, -5)

Total No. of printed pages = 4

ME 181104

Roll No. of candidate

2	0	0	6	1	0	0	0	3	0	7	8
---	---	---	---	---	---	---	---	---	---	---	---

2021

B.Tech. 1st Semester End-Term Examination

ENGINEERING MECHANICS

(New Regulation (w.e.f 2017 – 18) and New Syllabus)

(Group – B) (w.e.f 2018 – 2019)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any four from the rest.

1. Choose the correct answer : (10 × 1 = 10)

- (i) Which of the following is a vector quantity?
 - (a) Energy
 - (b) Mass
 - (c) Momentum
 - (d) Angle
- (ii) The process of finding out the resultant force is called _____ of forces.
 - (a) Composition
 - (b) Resolution
 - (c) Decomposition
 - (d) None of these
- (iii) According to the law of moments, if a number of coplanar forces acting on a particle are in equilibrium, then
 - (a) their algebraic sum is zero
 - (b) the algebraic sum of their moments about any point is equal to the moment of their resultant force about the same point
 - (c) their lines of action are at equal distances
 - (d) the algebraic sum of their moments about any point in their plane is zero
- (iv) If three forces acting in one plane upon a rigid body, keep it in equilibrium, then they must either
 - (a) meet in a point
 - (b) be all parallel
 - (c) at least two of them must meet
 - (d) all the above are correct

[Turn over

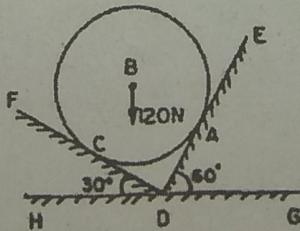


Figure 1

3. (a) Define and explain the terms: Perfect Frame, Imperfect Frame, Deficient Frame and Redundant Frame. (5)
- (b) A truss of span 9 m is loaded as shown in Figure 2. Find the reactions and forces in the members marked as 1, 2 and 3. (10)

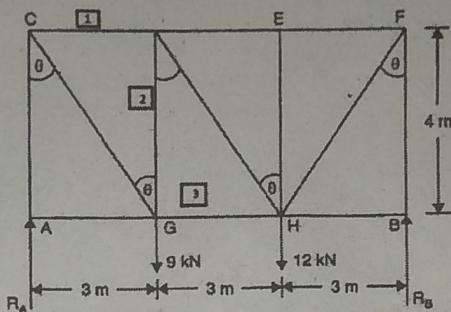


Figure 2

4. (a) State the Laws of Friction. (5)
- (b) A body of weight 500 N is lying on a rough plane inclined at an angle of 25° with the horizontal. It is supported by an effort (P) parallel to the plane as shown in Figure 3. (5)

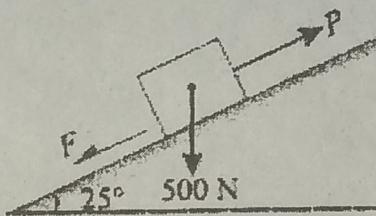


Figure 3

Determine the minimum and maximum values of P, for which the equilibrium can exist, if the angle of friction is 20° .

- (c) A uniform ladder of length 3.25 m and weighing 250 N is placed against a smooth vertical wall with its lower end 1.25 m from the wall. The coefficient of friction between the ladder and floor is 0.3. What is the frictional force acting on the ladder at the point of contact between the ladder and the floor? (5)

5. (a) Find the centre of gravity of a channel section $100 \text{ mm} \times 50 \text{ mm} \times 15 \text{ mm}$. (5)

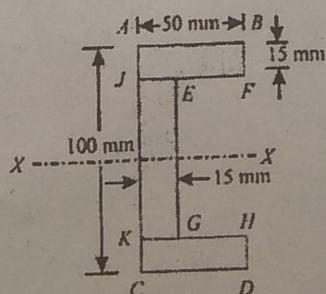


Figure 4

- (b) A semicircular area is removed from a trapezium as shown in Figure 5 (dimensions in mm). (10)

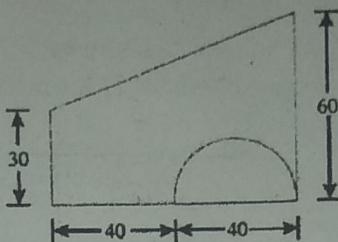


Figure 5

Determine the centroid of the remaining area.

6. (a) Define the following terms: Lifting Machine, Mechanical Advantage, Velocity Ratio, Ideal Machine, and Reversibility of a machine. (5)
- (b) State the "Law of Machine". State the types of lifting machine. (2 + 3 = 5)
- (c) A machine is raised a load of 360N through a distance of 200 mm. The effort, a force of 60 N moved 1.8 m during the process. (5)

Calculate :

- (i) Velocity Ratio
- (ii) Mechanical Advantage
- (iii) Effect of friction and
- (iv) Efficiency at this load

7. (a) State the principle of virtual work. (2)
- (b) Define Linear Impulse and Momentum. (3)
- (c) A weight (W) of 5 kN is raised by a system of pulleys as shown in Figure 6.

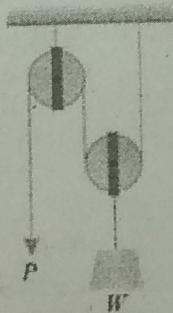


Figure 6

Using the method of virtual work, find the force P, which can hold the weight in equilibrium. (10)