BT-1811
Examination – June - 2022
B.Tech. I/II Sem: Common for all branches
Engineering Chemistry

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
Part c – Max 100 words and   Part d – Max 400 words.
Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) Distinguish between Hard water and Soft water.   02

(b) Why is hard water unsuitable for boilers?   02

(c) How is hardness of water expressed in different units? Prove that **mg/L** of hardness is the same as hardness in ppm of water.   03

(d) Describe Zeolite process of water softening. Compare this process with Lime Soda process with respect to advantages and disadvantages.   07

OR

(i) Calculate the total hardness of a water sample in ppm containing the following: $CaSO_4$ = 16.2 mg/L, $Mg(HCO_3)_2$ = 1.46 mg/L and $MgCl_2$ = 9.5 mg/L.   03

(ii) A water sample contains following in **mg/L**: $Mg(HCO_3)_2$ = 73, $CaSO_4$ = 68, $MgSO_4$ = 12 and $Ca(HCO_3)_2$ = 81. Calculate the amount of Lime and Soda in kg, required for softening of **20000** litres of water.   04

Q.2 (a) Define the terms Octane number and Cetane number.   02

(b) Compare the characteristics of Liquid and Gaseous fuels with appropriate examples.   02

(c) Distinguish between Proximate and Ultimate analysis of coal.   03

(d) A sample of coal was analysed as follows: 07

(a) **1.000 g** of air dried coal sample was weighed in a porcelain crucible. After heating for an hour in an oven at **105 – 110°C**, the dry coal residue weighed **0.985 g.**

(b) **1.000 g** same sample was taken in silica crucible and heated strongly in muffle furnace for exactly 7 minutes at **950±20°C**. The residue weighed **0.800 g.**

(c) **1.000 g** same sample was taken in silica crucible and heated at **700 – 750°C** for half an hour in muffle furnace until a constant weight was obtained. The residue was found to weigh **0.100 g.**

Calculate various parameters under proximate analysis.

OR

(i) Explain the term knocking. 03

(ii) Discuss process of refining of petroleum 04

Q.3 (a) Differentiate between Plastics and rubbers. 02

(b) What are nanomaterials. Give examples. 02

(c) Distinguish between Thermoplastics and Thermosettings. 03

(d) Give an account of following: 07

     (i) Vulcanisation of rubber   (ii) Bakelite

OR

Write preparation, characteristics and applications of: 07

     (i) SBR   (ii) Nylon **6:6**

Q.4 (a) Define Flash Point and Fire Point. 02

(b) Write composition of cement. 02

(c) Making use of following data, find the Viscosity Index of Sample oil. 03

S No	Type of Oil	Saybolt Universal Viscosity at 210°F	Saybolt Universal Viscosity at 100°F
1	Sample Oil	64 seconds	564 seconds
2	Gulf Coast Oil	64 seconds	758 seconds
3	Pennsylvanian Oil	64 seconds	419 seconds

(d) Explain the following giving significance: 07

     (i) Aniline Point   (ii) Cloud & Pour point

OR

Give an account of the following: 07

     (i) Setting and Hardening of cement   (ii) Refractoriness Under Load (RUL)

Q.5 (a) What is Electromagnetic Spectrum? 02

(b) Write advantages of Instrumental techniques over conventional methods. 02

(c) State and derive Beer Lambert's law. 03

(d) Write Principle, Instrumentation and applications of IR Spectroscopy. 07

OR

Write Principle, Instrumentation and applications of Gas Chromatography. 07

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Roll No. :..................

BT-1812
Examination – June – 2022
B.Tech. I/II Sem: Common for all branches
**Basic Electrical and Electronic Engineering**

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any. Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
Part c – Max 100 words and   Part d – Max 400 words.
Word limit NOT to be followed for diagram, numerical, derivation.

Q.1   (a)   State kirchoff's current law and voltage law   02

(b)   Discuss different type of sources   02
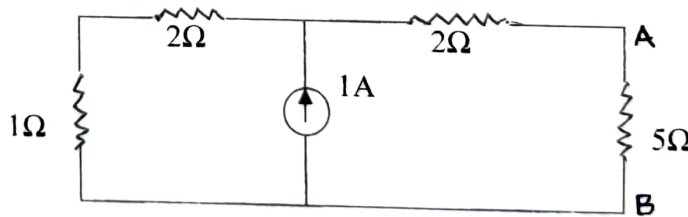
(c)   Find value of Vo by nodal analysis   03
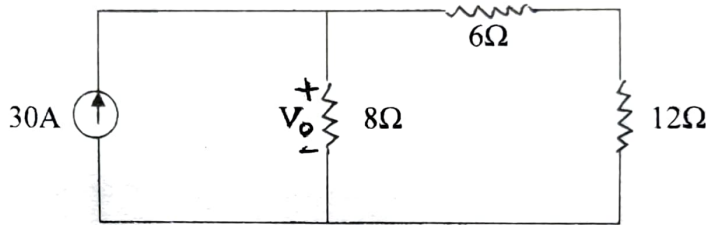
(d)   Find I in the circuit shown in fig.by using superposition.   07
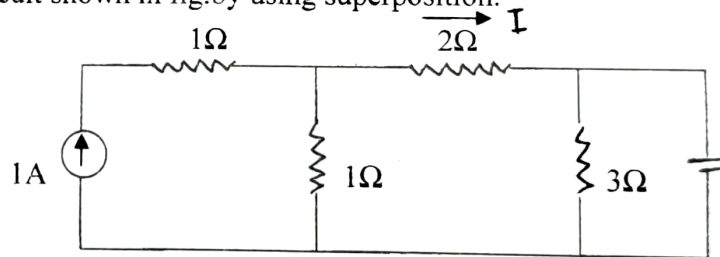
OR

Find power across AB terminal by Thevenin's Theorem   07

Q.2   (a)   Define r.m.s value and average value of an alternating quantity.   02

(b)   Draw the phasor diagram of R-L-C series circuit .   02

(c)   Draw power triangle and write formula of different power ?   03

(d) A resistance of **15 Ω** and capacitor of **150 µF** capacitance are connected in series across a **230 V, 50Hz** supply. Calculate (i) impedance of the circuit, (ii) current, (iii) Power factor and phase angle (iv) power consumed in the circuit.

OR

Prove in Delta connection system $V_L = V_{ph}$ and $I_L = \sqrt{3}Iph$ 07

Q.3 (a) Explain what will be happen if DC supply is applied to transformer?   02

(b) A **25KVA** transformer has **500** turns on the primary and **40** turns on the secondary winding. The primary is connected to **3000 V, 50 Hz** mains, calculate secondary E.M.F?   02

(c) Derive E.M.F equation of Transformer?   03

(d) A transformer is rated at **80KVA**. At full load its copper loss is **1000W** and its iron loss is **900 W**.   07

Calculate (a) The efficiency at full load, unity **p.f.**

(b) The efficiency at half load, **0.8 p.f.**   (c) The efficiency at **75%** full load, **0.8 p.f.**

OR

Explain open circuit and short circuit test of a single phase transformer with circuit diagram.   07

Q.4 (a) Explain the principle of **3** phase induction motor? State the types of induction motor.   02

(b) Why commutator is needed in the DC machine?   02

(c) Name the different types of DC generator? Explain separately-excited DC generator with its diagram.   03

(d) An **8** pole d.c shunt generator has **778** wave connected armature conductors running at **500** rpm supplies a load of **12.5 Ω**. Find out the armature current, the induced emf and the flux per pole given $R_a = 0.24\ \Omega$, $R_{sh} = 250\ \Omega$, $V_t = 250$ V.   07

OR

Name the various parts of a DC machine and give the function of each part?   07

Q.5 (a) Explain intrinsic and extrinsic semiconductor.

(b) Draw AND, OR and NOT Gate with the help of NAND Gate.   02

(c) Draw the **V-I** characteristics of semiconductor diode.   03

(d) Explain the working of full wave rectifier with waveform and drive its average value.   07

OR

Solve the following: 07

$(150.1875)_{10} \rightarrow (N)_2$

$(227)_8 \rightarrow (N)_2$

$(4C.D)_{16} \rightarrow (N)_{10}$

Add $(10101.11)_2 + (111001.00)_2$

Sub $(1111001)_2 - (111101)_2$

2's complement of 0101110

Add $(25)_8 + (177)_8$

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BT-1813
Examination – June -2022
B.Tech. I&II Sem : Common for all branch
Engineering Graphics

Time : 3 Hrs

Max. Marks : 70

Min. Marks : 22

Note: Total number of questions are 10. Attempt any one question (Including all part) from each unit. Assume missing data, if any, suitably.

UNIT-I

Q.1   (a)   A 4 cm length on a map represents 1.5 m length. Determine the R.F. and draw a scale long enough to measure up to 6m. Show a distance of 4.6 m on it.   07

(b)   The major axis of an ellipse is 100 mm and minor axis 60 mm long. Draw an ellipse by concentric circle method.   07

OR

Q.2   (a)   The distance between two stations by road is 200 km and it is represented on a certain map by a 5 cm long line. Find R.F. and construct a diagonal scale showing single kilometer and long enough to measure up to 600 km. Show a distance of 467 km on this scale.   07

(b)   Draw an involute of a circle of 50 mm diameter.   07

UNIT-II

Q.3   A 70 mm long line PQ is inclined at 45^0 to the V.P. Its end P in the H.P. and 15 mm in front of the V.P. The top view of the line measure 60 mm. Draw its projections and determine true inclination with H.P.   14

Q.4 The projectors of the ends of a line AB are 60 mm 14 apart. The end A is 25 mm above H.P. and 30 mm in front of the V.P. The end B is 20 mm below H.P. and 40 mm behind the V.P. Determine the true length and inclination with the two planes.

UNIT-III

Q.5 (a) A hexagonal lamina with 30 mm sides has one of the 07 sides perpendicular to V.P. The surface of the lamina is parallel to and 15 mm above H.P. Draw its projections.

(b) A square plane with 40 mm sides is situated in the 07 V.P. with all the sides equally inclined to H.P. Draw its projections.

OR

Q.6 A hexagonal prism of 30 mm base edges and axis 65 14 mm long has an edge of its base in the H.P. such that the axis is inclined at 30^0 to the H.P. and parallel to V.P. Draw its projections.

UNIT-IV

Q.7 A square prism 25 mm base side and 69 mm height is 14 kept on H.P. with its axis vertical and two adjacent base sides equally inclined to V.P. It is cut by a section plane whose V.T. makes an angle of 30^0 with the reference line and bisects the axis. Draw sectional top view and true shape of section.

OR

Q.8 A cone with a 50 mm base diameter and 60 mm long 14 axis rests with its base on the H.P. Draw the development of its lateral surface when it is cut by an auxiliary inclined plane bisecting the axis and inclined at 60^0 to the H.P.

UNIT-V

Q.9   Draw an isometric view of the frustum of a cone of 50   14
mm base diameter, 25 mm top diameter and 60 mm
height.

OR

Q.10 (a)   Describe the snap and grid commands to regulate the   07
cursor movement for locating a point quickly.

     (b)   Explain any two methods of drawing a circle in   07
AutoCAD.

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BT-1814
Examination – June – 2022
B.Tech. I/II Sem: Common for all branches
Communication Skills

Max. Marks: 70

Min. Marks: 22

Time: 3 Hrs.

Note: Total number of questions is 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.

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Part c – Max 100 words and   Part d – Max 400 words.

Word limit NOT to be followed for diagram.

Attempt all parts of a question at one place.

Q.1   (a)   Where are definite and indefinite articles used?   02

(b)   What do you mean by voice (in grammar)?   02

(c)   How is a comma different from a semi colon? Explain giving example.   03

(d)   Explain at least 4 different uses of Present Continuous Tense giving an example of each. 07

OR

What is a preposition? Explain the different types of prepositions giving examples of   07
two different prepositions in each category (by using in sentences)

Q.2   (a)   What are root words?   02

(b)   How does thesaurus help in building vocabulary?   02

(c)   What group of words 'there/their/they're' belong to? Differentiate the meaning by   03
making sentences.

(d)   What do you understand by the following: 07

(i)   Prefixes and Suffixes
(ii)   One word substitution

OR

Write short notes on the following: 07

(i)   Advantages and disadvantages of Scientific Jargon.
(ii)   Role of vocabulary in developing English Language Skills.

Q.3   (a)   Define verbal communication?   02

(b)   What is noise in the process of communication?   02

(c)   When does communication situation exist?   03

(d) Discuss the advantages and disadvantages of written communication. 07

OR

Discuss the socio-psychological barriers in communication. 07

Q.4 (a) What do you understand by passive reading? 02

(b) When is note making useful? 02

(c) What are the parts of a paragraph? 03

(d) Explain the Cornell Method of note taking 07

OR

What are the steps to write a good précis? 07

Q.5 (a) What are minutes in business communication? 02

(b) What does heading of a letter generally include? 02

(c) What is the difference between a notice and a circular? 03

(d) What are the do's and don'ts of email writing? 07

OR

What does the main body of a report include? Explain. 07

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BT-1815

Examination – June - 2022
B.Tech. I/II Sem: Common for all branches
Engineering Mathematics - I

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. **Each Question has 4** parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
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Q.1 (a) Write the statement of Maclaurin's theorem.   02

     (b) Write the statement of Taylor's theorem.   02

     (c) Expand logx in power of $(x - 1)$ by Taylor's theorem.   03

     (d) Discuss the maxima and minima of the function $U = Sinx + Siny + Sin (x + y)$. 07

OR

Find the radius of curvature at the Pamt "t" of the curve.   07

$$x = 3a\ cost - a\ cos3t, \quad y = 3a\ sint - asin3t$$

Q.2 (a) Write the statement of Euler's theorem for two variable   02

     (b) If $u = sin^{-1} (x/y) + tan^{-1} (y/x)$ Show that $x\ \partial u/ \partial x + y\ \partial u/ \partial y = 0$ 02

     (c) if $u = (x^2 + y^2 + z^2)^{-1/2}$ Show that $\partial u/ \partial x + \partial u/ \partial y + \partial u/ \partial z = - u$ 03

     (d) If $x^x y^y z^z$ show that $\partial^2 z/ \partial x\ \partial y = -(x\ logex)^{-1}$ 07

OR

If $u = tan^{-1} (x^3 + y^3)/x - y$ then   07
Prove that $x^2\ \partial^2 u/ \partial x^2 + 2xy\ \partial^2 u/ \partial x\ \partial y + y^2\ \partial^2 u/ \partial y^2 = sin4u - sin2u$

Q.3 (a) Evaluate $\int_0^2 \int_0^1 (x^2 + y^2)\ dx\ dy$ 02

     (b) Write the relation between Beta and gamma function.   02

     (c) Evaluate limit of a sum in the form of a definite Integral :   03

$$Lim\ n \rightarrow ⧄ \left\{ \frac{1}{n+1} + \frac{1}{n+2} + \cdots + \frac{1}{2n} \right\}$$

     (d) State and prove Duplication formula.   07

Evaluate $\int_0^4 \int_0^x \int_0^{x+y} z\,dz\,dy\,dx$ 07

Q.4 (a) Define Echelon form of a matrix with example.   02

(b) Find the characteristic root's of the matrix   02

$$A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

(c) Find the rank of the matrix   03

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 2 & 3 \\ 0 & -1 & -1 \end{bmatrix}$$

(d) Find the Eigen values and Eigen vectors of the matrix   07

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

OR

Solve the equation   07

$$x + y + z = 3$$
$$x + 2y + 3z = 4$$
$$x + 4y + 9z = 6.$$

Q.5 (a) Define Tautology and Contradiction.   02

(b) Prove that $p \rightarrow q$ is equivalent to $\sim p \vee q$ when **p** and **q** are statement   02

(c) Prove that Idempotent law **(1)** a + a = a **(2)** a . a = a   03

(d) Define: 07
(1) Graph
(2) Degree of vertex
(3) Tree
(4) Isomorphic graph
(5) Simple graph

OR

Express the following function into disjunctive normal form: 07

$$F(x, y, z) = (x + y)(x + z') + (y + z')$$

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BT-1821
Examination – June - 2022
B.Tech. I/II Sem: Common for all branches
Engineering Physics

Time : 3 Hrs   Max. Marks : 70
                                                           Min. Marks : 22

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Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) Define coherence in optical sources. 02

(b) Differentiate between interference and diffraction patterns. 02

(c) Write a short note on Young's double slit experiment. 03

(d) Using a neat labeled diagram explain Newton's rings experiment. 07

OR

Write a note on quarter and half wave plates. 07

Q.2 (a) Explain Coulomb's law for electric field? 02

(b) Discuss Gauss's law for magnetic fields. 02

(c) Find divergence of vector $2\hat{x} - 3\hat{y} + 5\hat{z}$. 03

(d) Write Maxwell's equations. 07

OR

Write a note on equation of continuity. 07

Q.3 (a) State de-Broglie relation between momentum and wavelength. 02

(b) The analysis of particle in box revealed that the energy levels are (i) Continuous (ii) quantized. Write the correct option form (i) and (ii) 02

(c) Define wave function for matter waves. 03

(d) Deduce time independent Schodinger wave equation. 07

OR

Write notes on (i) Phase velocity (ii) group velocity (iii) Uncertainty principle. 2+2+3

Q.4 (a) Draw characteristics of a p-n diode. 02

(b) Superconductors have .... resistance (Finite/ Infinite / Zero). 02

(c) What are semiconductors? Give an example of most common semiconductor material. 03

(d) Write a note on solar cell. 07

OR

Give some applications of nanotechnology. 07

Q.5 (a) Optical fibers works on the principle of 02

(b) The most important property of laser light is 02

(c) Explain population inversion in lasers. 03

(d) Discuss working of a Ruby laser. 07

OR

Describe the construction of an optical fiber. 07

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BT 1822
Examination – June - 2022
B.Tech. I/II Sem: Common for all branches
Basic Civil Engineering and Engineering Mechanics

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

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Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) State size of bricks. — 02

(b) Enlist types of stones. — 02

(c) Explain the material timber with neat sketch. — 03

(d) Explain different types of laboratory test of cement. — 07

OR

Classify different classes of the bricks and their properties. — 07

Q.2 (a) Define force. — 02

(b) State condition of equilibrium. — 02

(c) State and proof lamis theorem. — 03

(d) Define: — 07
(i) polygon law of forces (ii) varignons theorem (iii) system of forces with sketch.

OR

Two cylinders '1' & amp; '2' rest in the horizontal channel as shown in figure. The cylinder '1' has a weight of 500 N and radius of 180mm. The cylinder '2' has a weight of 200 N and a radius of 100 mm. The channel is 360 mm wide at the bottom with one side vertical. The other side is inclined at an angle 60^0 with the horizontal. Find the reactions. — 07
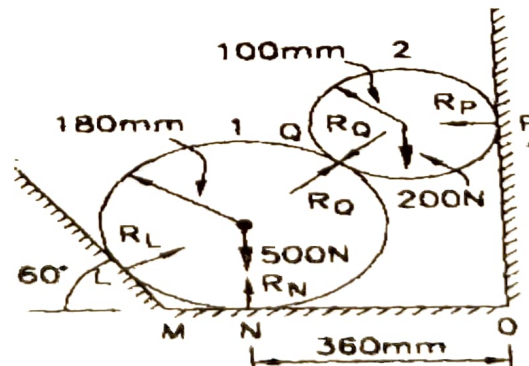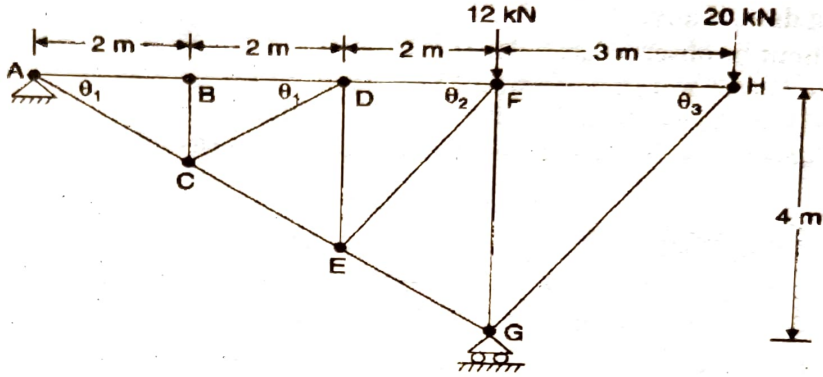

Q.3 (a) What are perfect truss — 02

(b) State equation for perfect truss. — 02

(c) State assumptions for analysing truss. — 03

(d) Find the forces in all the members of the truss in figure.
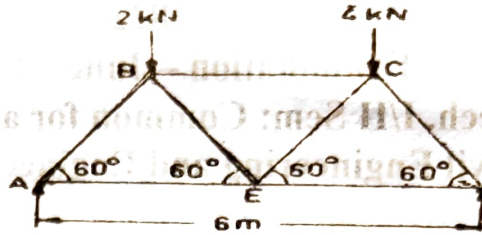
OR

Find the forces in all the members of the truss shown in figure.   07


Q.4 (a) What is shear force?

(b) Define bending moment.   02

(c) Define beam.   02

(d) Explain the different types of beams and loadings with neat sketch.   03

                                                                                07

OR

Find the support reactions for a simply supported beam of span **10 m** loaded with a udl   07
of **3 kN/m.**

Q.5 (a) Differentiate between centroid and centre of gravity

(b) Define moment of inertia with suitable example.   02

(c) State and proof perpendicular axis theorem   02

(d) Find out the centroid of the following section   03

                                                                                07
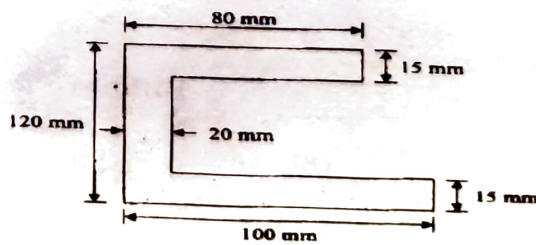
OR

Compute the moment of inertia for the following section   07

2
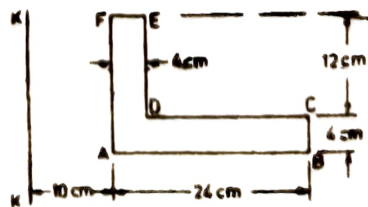
BT-1822

BT-1823
Examination – June – 2022
B.Tech. I/II Sem: Common for all branches
Basic Mechanical Engineering

Time: 3 Hrs

Max. Marks: 70
Min. Marks: 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
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Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) What is the thermodynamic system? State the various types of thermodynamic system.   02

(b) State the first law of thermodynamics applied to a closed system.   02

(c) Compare fire tube and water tube boilers.   03

(d) Define coefficient of performance (COP) of heat pump and refrigerator. Prove that $[COP]_{HP} = [COP]_{Ref} + 1$ 07

OR

A refrigeration plant operates on a reversed Carnot cycle between the temperatures of −10°C and 30°C. If the capacity of the refrigerator is 200 tonnes of refrigeration, determine the minimum power required to run the plant.   07

Q.2 (a) What is Newton's law of viscosity?   02

(b) State the Bernoulli's equation for incompressible fluids.   02

(c) What is Reynold's number? State its physical significance?   03

(d) Discuss the working principle of fluid coupling with a neat sketch.   07

OR

Two plates are placed at a distance of 3 mm apart. The lower plate is fixed while the upper plate having a surface area of 1.0 m² is pulled with a speed of 2 m/s. Find the force required if the fluid placed between the two plates is having dynamic viscosity of 0.5 Pa.s.   07

Q.3 (a) How internal combustion (I.C.) engines are classified?   02

(b) Compare spark Ignition (S.I.) and compression ignition (C.I.) engine?   02

(c) State the working of four stoke petrol engine with a neat sketch?   03

(d) Show that the thermal efficiency of the Otto cycle depends only on the compression ratio.   07

A petrol engine working on Otto cycle has piston displacement of 800 cc and clearance   07
volume of 120 cc. Determine the air standard efficiency of petrol engine.

Q.4 (a) How the engineering materials are classified?   02

(b) Compare the ductile and brittle materials.   02

(c) What is Hook's law? Define modulus of elasticity.   03

(d) Draw and explain the stress-strain diagram for a ductile material. Show the important   07
points on this diagram.

OR

Discuss the various mechanical properties of engineering materials.   07

Q.5 (a) How welding processes are classified?   02

(b) Compare the merits and demerits of A.C. and D.C. welding.   02

(c) State the three types of flames used in a gas welding with a neat sketch.   03

(d) What is lathe machine? Enumerate the basic operations which can be performed on   07
lathe machine.

OR

What is drilling machine? Enumerate the basic operations which can be performed on   07
drilling machine.

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BT-1824
Examination – June - 2022
B.Tech. I/II Sem: Common for all branches
Energy, Environment, Ecology & Society

Time : 3 Hrs   Max. Marks : 70
                                                                           Min. Marks : 22

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Part a – Max 50 words,   Part b – Max 50 words,
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Word limit NOT to be followed for diagram, numerical, derivation.

Q.1 (a) What is Marine Energy? Write various ways in which energy from the ocean can be obtained?   02

(b) How is the acid rain forming?   02

(c) Discuss the energy scenario in India.   03

(d) Discuss the characteristics of different atmospheric segments?   07

OR

What are primary air pollutants? Discuss the sources and relative contribution to air pollution?   07

Q.2 (a) Explain the concept of Energy Pyramids?   02

(b) Describe the component parts of an Ecosystem?   02

(c) Give classification and function of an Ecosystem?   03

(d) Discuss the structure and functions of following: 07
(i) Forest ecosystem
(ii) Pond ecosystem

OR

Explain in detail the Solid Waste Management and the methods of Recycling the waste?   07

Q.3 (a) What is decibel scale?   02

(b) What are the sources of air pollutants?   02

(c) Explain four major air pollutants and their consequences?   03

(d) Discuss the mechanism of Depletion of Ozone Layer. What are the adverse effects of Ozone Layer?   07

1

What is global warming? Explain causes and effects of global warming?

07

Q.4 (a) What are the methods to minimize Soil Pollution?

02

(b) Differentiate between Organic and Inorganic water pollutants?

02

(c) Explain the term DO, BOD and COD?

03

(d) Give the flow diagram for the Activated Sludge Process and describe the working of the Activated Sludge Unit?

07

OR

Discuss the Waste Water Treatment of any of the four Common Industries?

07

Q.5 (a) What do you understand by moral values?

02

(b) Describe the Impact of waste on Society.

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(c) What is Environmental Pollution? Discuss some Environmental Problems due to population and Technology?

03

(d) What is Environmental Impact Assessment? Why EIA is Required? Give Benefits of EIA?

07

OR

Define Ethics? Explain the Importance of ethics in society .Discuss various ethical situations?

07

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BT-1825
Examination – June - 2022
B.Tech. I/II Sem: Common for all branches
Engineering Mathematics - II

Time : 3 Hrs

Max. Marks : 70
Min. Marks : 22

Note: Total number of questions are 05. All Questions are compulsory. Each Question has 4 parts (a, b, c, d). Part a, b & c are compulsory while Part d has internal Choice. Assume missing data, if any.
Word limit be observed as follows:
Part a – Max 50 words,   Part b – Max 50 words,
Part c – Max 100 words and   Part d – Max 400 words.
Word limit NOT to be followed for diagram, numerical, derivation.

Q.1   (a)   Write the standard form of Linear differential equation.   02

(b)   Find, Particular integral **(P.I.)** $(D^2+D+1)\,y = \sin 2x$ 02

(c)   Find, complementary function **(C.F.)** $\dfrac{d^3y}{dx^3} - 3\dfrac{d^2y}{dx^2} + 4y = 0$ 03

(d)   Solve : $\dfrac{d^2y}{dx^2} - 4y = e^x + \sin 2x$ 07

OR

Apply the method of variation of parameters to solve: $\dfrac{d^2y}{dx^2} + y = x$ 07

Q.2   (a)   Define Legendre's linear differential equation.   02

(b)   Give the C.F. of $x^3\dfrac{d^2y}{dx^2} - x^2\dfrac{dy}{dx} - 3xy = x^2$ 02

(c)   Solve: $x^2\dfrac{d^2y}{dx^2} - 4x\dfrac{dy}{dx} + 6y = x.$ 03

(d)   Solve: $x\dfrac{d^2y}{dx^2} - (2x-1)\dfrac{dy}{dx} + (x-1)y = 0.$ 07

OR

Solve: $\dfrac{dx}{dt} + 5x + y = e^t.$ 07

$\dfrac{dy}{dt} - x + 3y = e^{2t}.$

Q.3   (a)   Write the form of Lagrange's equation and its auxiliary equation.   02

(b)   Solve: $p + q = \sin 2x.$ 02

(c)   Solve: $(D^2 + 3DD' + 2D'^2)\,z = \sin(2x + 3y).$ 03

(d)   Solve: $(mz - ny)\,p + (nx - lz)\,q = ly - mx.$ 07

1

OR

A string is stretched between the fixed points **(0, 0)** and **(1, 0)** and released from rest 07
from the position **u = A sin πx.** Find the formula for its subsequent displacement
u(x, t).

Q.4 (a) Define analytic function.   02

(b) Test the analytic behavior of **f(z) = logz.**   02

(c) Use Cauchy-Riemann equation to find **V** . Where **u = 3x²y − y³**   03

(d) State and prove Cauchy-Riemann equation in Cartesian co-ordinate.   07

OR

If   **w = Ø + iφ** is represents the complex potential for an electric field and   07
$\varphi = x^2 - y^2 + \frac{x}{x^2+y^2}$, find the function of **Ø.**

Q.5 (a) Write the statement of Cauchy's Residue theorem .

(b) Find the order of each pole and residue at it of   02

$$\frac{1-2z}{z(z-1)(z-2)}$$.

(c) If **f(z)** is an analytic function and **f '(z)** is continuous at each point within and on a   03
simple closed curve **C**, then

$$\int_c f(z)\, dz = 0.$$

(d) **State and prove Cauchy Integral Formula.**   **07**

OR

Evaluate   07

$$\int_c \frac{(4-3z)dz}{z(z-1)(z-2)},$$

Where **c** is the circle **|z| = 3/2** .

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