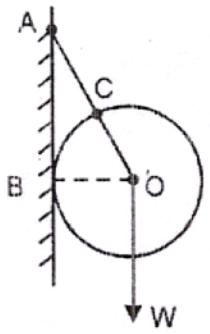
(c) Explain the different types of loads acting on the beam with a neat diagram of each. **3**

4. (a) A smooth sphere of weight W as s own in the figure is supported by a string attached to point A on the smooth vertical wall, the other end is in touch with wall at point B as shown below. If the length of string AC is equal to radius of the sphere, then find tension (T) and reaction on the wall. **6**



Roll No. ..... **(250)**

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EM-22204

Second Semester (Common to All)

(N-2022)

ENGINEERING MECHANICS

Time :* 3 *Hours **M. M. : 60**

Note : Attempt *Five* questions in all. Section A (Q. No. **1**) is compulsory. Select *two* questions each from Section B and Section C.

Section A

1. Explain the following : **2×6=12**

(a) Varignon's Theorem.

(b) Lami's Theorem

(c) Limiting equilibrium

(d) Centre of gravity

(e) Efficiency of machines

(f) Moment of force.

Section B

2. (a) Determine the magnitude and direction of the resultant of the following coplanar concurrent forces acting at a point : **6**

(i) 46 N pulling East

(ii) 322 N pulling North - East

(iii) 322 N pulling North 45° West

(iv) 394 N pulling South 60° West

(v) 394 N pulling at 30° West of South.

(b) Define 'Force'. Explain its characteristics and effects. **3**

(c) At what angle must the two forces P, 2P act so that their resultant may be $\sqrt{7P}$. **3**

3. (a) A simply supported beam of negligible weight and 8 m long carries a point load of 40 kN at 3 m from the left end support and a uniformly distributed load of 10 kN/m over the length of 4 m from right end support of the beam. Determine the reactions at the supports. **6**

(b) Explain the concept of free body diagram. 3

(b) Explain the term 'Force System'. Write its classification. **3**

(c) Prove that in limiting equilibrium, angle of repose is equal to the angle of friction. **3**

Section C

5. (a) A body of mass 250 kg is placed on a rough inclined plane of 30°. If the co-efficient of limiting friction between plane and body is 0.48, find the greatest and least forces acting parallel to the plane to keep he body in equilibrium. **6**

(b) Write the laws of static friction. **3**

(c) Explain, why friction is a necessary evil ? **3**

6. (a) A solid hemisphere of diameter 16 cm is placed on the top of a solid cylinder whose diameter is also 16 cm. The height of the cylinder is 20 cm. Find the C.G. of the composite body. **6**

(b) Differentiate between centroid and centre of gravity. **3**

(c) Write the position of centroid/centre of gravity of the following : **3**

(i) Right circular solid cone

(ii) A semi-circle

(iii) A hemisphere.

7. (a) A simple screw jack has a pitch of the screw 1 cm and the length of the handle 40 cm. If the efficiency of the jack is 40% find the effort required at the end of handle to lift a load of 5000 N. **6**

(b) Derive the condition of reversibility of a machine. **3**

(c) A lifting machine has velocity ratio of 25, lifts a load of 380 N with an efficiency of 80%. What would be the mechanical advantage ? What effort would be required ? **3**

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7. (a) What is solar water heaters ? How does it work and what are the applications of Solar water heater ? 6

(b) What is the difference between Metallic wastes and Non-metallic wastes ? 3

(c) What is Hazardous Waste ? Explain. 3

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Total No. of Questions—7] [Total No. of Printed Pages—4

ES-22205

Second Semester (N-22)

(Common to Group A, Group B and AR)

ENVIRONMENTAL SCIENCE

Time : 3 *Hours* M. M. : 60

Note : Attempt *Five* questions in all. Section I (Q. No. 1) is compulsory. Attempt any *two* questions from Section II and any *two* questions from Section III.

Section I

1. (i) Non-living factors in the environment are called.....factors.

(ii) Noise is defined as undesirable and unwanted..... .

(iii) Planting new tree and plant is..... .

(iv) .....is the thermal energy generated and stored inside the Earth's Crust.

(v) MSW abbreviated as..... .

(vi) ....., a greenhouse gas, is the main pollutant that is warming Earth. **6×2=12**

Section II

2. (a) What is Air Pollution ? How do catalytic converter reduce air pollution ? **6**

(b) Write a short note on food chain. **3**

(c) What is Greenhouse effect ? How is it responsible for global warming ? **3**

3. (a) What is the carbon cycle and how does it work ? **6**

(b) What are the effects of noise pollutions ? **3**

(c) Write down some preventive measures of soil pollution. **3**

4. (a) What is Reverse Osmosis and how does it work in water purification ? **6**

(b) Give the important difference between BOD and COD. **3**

(c) What is Ozone layer depletion ? **3**

Section III

5. (a) Define wind energy. What are benefits and problem of wind energy ? **6**

(b) What are the applications of hydrogen energy ? **3**

(c) What is e-Waste ? Explain. **3**

6. (a) What is sanitary landfills ? What are the advantages of sanitary landfills ? **6**

(b) What are the applications of ocean energy ? **3**

(c) Write a short note on biogas. **3**

7. (a) Explain Transformer and derive EMF equation of transformer **6**

(b) Differentiate between core type and shell type transformer **3**

(c) Explain Autotransformer. **3**

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Total No. of Questions—7] [Total No. of Printed Pages—4

FEEE-22203

Second Semester (Common to all)

(N-22)

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Time :* 3 *Hours **M. M. : 60**

Note : Attempt *Five* questions in all. Section A (Q. No. **1**) is compulsory. Select *two* questions each from Section B and Section C.

Section A

1. (a) All the domestic appliances are connected in.....with the supply. **1**

(b) The unit of magnetic field intensity is .....or..... . **1**

(c) The maximum value of power factor in ac circuit can be..... . **1**

(d) Ideal current source has..... internal resistance. **1**

(e) The magnitude of hysteresis loss depends upon area of hysteresis loop, volume of magnetic material and..... . **1**

(f) The commercial unit of electrical energy is..... . **1**

(g) The unit of self inductance is..... . **1**

(h) The magnitude of dynamically induced r. e.m.f. is given by the expression..... . **1**

(i) MOSFET stands for..... . **1**

(j) The unit of capacitor is..... . **1**

(k) LED stands for..... . **1**

(l) In an AC circuit reciprocal of impedance is called..... . **1**

Section B

2. (a) Explain active and passive components in detail. **6**

(b) What do you mean by FET ? **3**

(c) What IS ZENER DIODE ? **3**

3. (a) Define CMMR and PSRR of operational amplifier. **6**

(b) What do you mean by offset Voltage ? **3**

(c) Explain slew rate. **3**

4. (a) What is full adder ? Explain. **6**

(b) State the principle of duality. **3**

(c) What is AND gate ? **3**

Section C

5. (a) What are the differences between mutually and self induced emf ? **6**

(b) State Faraday's laws of electromagnetic induction. **3**

(c) Explain hysteresis loop. **3**

6. (a) Define and explain Ohm's law. **6**

(b) What is the difference between RMS value and Average value of an alternating quantity ? **3**

(c) What is power factor ? **3**

11. Expand HDMI.

12. Which language is directly understood by computer ?

Section II

Note : Attempt any *two* questions.

1. (a) What is a Computer ? Explain its working with the help of a block diagram. **6**

(b) Define Booting. What are its types ? **3**

(c) Explain the working of internet browser. **3**

2. (a) What is OS ? Explain the functions of OS. **6**

(b) Write a short note on peripheral device. **3**

(c) What is a search engine ? How is ranking done by search engine ? **3**

3. (a) What do you understand by a national portal ? Write a page about national portal of India. **6**

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Total No. of Questions—18] [Total No. of Printed Pages—6

IITS-22106

First Semester (Common to All)

Common to Group B in First Semester

(CI, ME, AU, IN, EEE, MT) (N-2022)

Common to Gr-A in Second Semester

CO, IT, ET, EX, IOT, MLT

INTRODUCTION TO IT SYSTEMS

Time :* 3 *Hours **M. M. : 60**

Section I

Note : All questions are compulsory. **1×12=12**

1. Which is the default alignment in MS Word ?

(a) Right

(b) Centre

(c) Left

(d) Justify

2. What is the extension of an MS Word file ?

3. Which of the following is an example of page orientation ?

(a) Landscape

(b) Subscript

(c) Superscript

(d) A4

4. Which enables us to send the same letter to different people ?

(a) Macros

(b) Template

(c) Mail merge

(d) None of the above

5. Which of the following is the first calculating device ?

(a) Abacus

(b) Calculator

(c) Turing Machine

(d) Pascaline

6. Which cable is used to connect a hard drive to a motherboard ?

(a) A SATA Cable

(b) An IDE Cable

(c) A USB Cable

(d) A PS2 Cable

7. What is a URL ?

8. Full form of USB is..... .

9. 1 GB is equal to :

(a) 1024 MB

(b) 1028 MB

(c) 256 MB

(d) 1012 MB

10. Which of the following is an example of non-volatile memory ?

(a) ROM

(b) RAM

(c) Cache Memory

(d) All of the above

(b) What is a software ? Why do you need it ? How are they created ? **3**

(c) What is a memory in computer ? What are its types ? What are their usecases with reference to its types ? **3**

Section III

Note : Attempt any *two* questions.

4. (a) What is mail merge ? When is it required ? Write steps to mail merge a document to 5 recepients considering a scenario where a teacher dispatches marks of 5 different subjects obtained by students to their respective parents. **6**

(b) What is Spreadsheet ? How is a Formula different from a Function in Excel ? **3**

(c) What is a virus ? How antivirus protects against a virus ? **3**

5. (a) Answer the following w.r.t Microsoft excel : **6**

(i) How can we merge multiple cells text strings in a cell ?

(ii) How can you split a column into 2 or more columns ?

(iii) What is a filter ?

(b) What is an online threat ? Explain any *three* types of online threats. **3**

(c) What is MS Word ? What are its uses ? Which formatting features can be added to the MS Word document ? **3**

6. (a) Discuss simple functions used in Microsoft excel with example. **6**

(b) What is an online fraud ? **3**

(c) Give usecases of Computer, Internet and Softwares. **3**

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(c) Find AB if :

$$A = \begin{bmatrix} 1 & 4 & 2 \\ 3 & 5 & 7 \\ 3 & 6 & 11 \end{bmatrix}, B = \begin{bmatrix} 2 & 4 & 7 \\ 1 & 2 & 9 \\ 3 & 4 & 5 \end{bmatrix}$$

12

3. (a) Evaluate :

$$\int (\sin x)^3 \cos x dx$$

(b) Evaluate :

$$\int x \cos x dx$$

(c) Evaluate :

$$\int_0^{\pi/2} \sin^6 x dx$$

4. (a) Find area of curve $y = 4x^2$ between $x = 0$ to $x = 5$.

(b) Find volume of sphere of radius sum using integration.

(c) $\int \frac{xdx}{(x+1)(x+2)}$ **12**

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Total No. of Questions—07] [Total No. of Printed Pages—06

MATH-22201

Second Semester (Mathematics-II)

(Common to All)

(N-2022)

Time : 3 Hours **M. M. : 60**

Note : Section A is compulsory. It contain 12 questions of 1 mark each. Attempt any *two* questions in Section B and Section C. They are of 12 marks each.

Section A

1. Write true or false for these questions : **12×1=12**

(a) $\begin{vmatrix} 1 & 4 \\ 2 & 8 \end{vmatrix} = 0$. (True/False)

(b) $X = A^{-1}B$. (True/False)

(c) $\int \cos x dx = \sin x + C$. (True/False)

(d) $\int \frac{1}{x} dx = \log x + C$. (True/False)

(e) Area of curve $= \int_a^b y dx$. (True/False)

(f) Volume of curve $= \pi \int_a^b y^2 dx$. (True/False)

(g) Equation of circle is $2x + 3y + 5 = 0$. (True/False)

(h) Equation of line in intercept form $\frac{x}{a} + \frac{y}{b} = 1$. (True/False)

(i) Equation of circle in diameter form $(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$. (True/False)

(j) Equation of Parabola is $y^2 = 4ax$. (True/False)

(k) Order of Diff. equation $\left(\frac{d^2y}{dx^2}\right)^3 = x\left(\frac{dy}{dx}\right)$ is 2. (True/False)

(l) Degree of D.E. $\left(\frac{dy}{dx}\right)^4 = x + \left(\frac{d^3y}{dx^3}\right)^2$ is 2. (True/False)

Section B

2. (a) Solve by Crammer's rule :

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

$$x + y + 4z = 6$$

$$3x + 4y + 5z = 12$$

(b) Prove that :

$$\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} = 0$$

Section C

5. (a) Find equation of straight line with intercept equal and passing through (2, 3).

(b) Find centre and radius of circle :

$$x^2 + y^2 + 4x + 6y - 48 = 0$$

(c) Find equation of circle with diameter as end points (2, 4), (6, 8). **12**

6. (a) Find A^2 if $A = \begin{bmatrix} 2 & 4 & 6 \\ 4 & 7 & 8 \\ 5 & 6 & 9 \end{bmatrix}$.

(b) Evaluate :

$$\int (\log x)^2 \times \frac{1}{x} dx$$

(c) Write order and degree $\left(\frac{d^2y}{dx^2}\right)^3 = 5 + 7x$.

12

7. (a) Solve D.E. $(1+x)dy = (1+y)dx$.

(b) Find vertex, focus, latus rectum $y^2 = 16x$.

(c) Evaluate :

$$\int_0^{\pi/2} \sin^4 x \cos^6 x dx.$$ **12**

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(c) Define *p-n* junction diode. Explain its forward biasing. **3**

7. (a) Explain working of He-Ne gas laser with energy level diagram. **6**

(b) Write down the applications of optical fibre. **3**

(c) Explain principle and working of half wave rectifier. **3**

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Roll No. ..... **(248)**

Total No. of Questions—7] [Total No. of Printed Pages—4

PHY-22202

Second Semester (N-2022)

(Common to All)

APPLIED PHYSICS-II

Time* : 3 *Hours **M. M. : 60**

Note : Attempt *Five* questions in all, selecting *two* questions from each Section B and Section C. Section A (Q. No. **1**) is compulsory.

Section A

1. (a) Write two properties of sound wave.

(b) What is lens maker formula ?

(c) Write units of charge and potential difference.

(d) Write down factor affecting resistance of a wire.

(e) Define intrinsic and extrinsic semiconductor.

(f) Explain population inversion. 6×2=12

Section B

2. (a) Define S.H.M. Derive an expression for acceleration of particle executing S.H.M. **6**

(b) Differentiate between transverse and longitudinal wave motion. **3**

(c) Write down the methods to control reverberation time. **3**

3. (a) Explain principle and magnifying power of simple microscope. **6**

(b) Define total internal reflection. Write down the conditions for total internal reflection. **3**

(c) Explain laws of refraction. **3**

4. (a) State and prove Gauss's Law. **6**

(b) Three-capacitors each of capacitance 5 μF are connected in parallel. This combination is connected in series with a fourth 15 μF capacitor. Find the resultant capacitance of the combination. **3**

(c) State and explain Coulomb's law. **3**

Section C

5. (a) State and Explain Kirchhoff's Laws. **6**

(b) A current of 2 A passing through conductor produces 80J of heat in 10 seconds. Find the resistance of the conductor. **3**

(c) Define diamagnetic substance. Write down its properties. **3**

6. (a) Derive an expression for force on current carrying conductor placed in magnetic field. **6**

(b) Explain the method to convert a galvanometer into an ammeter of given range. **3**