University of Mumbai

Program: First Year (All Branches) Engineering

Curriculum Scheme: Rev2019

Examination: FE Semester II

Course Code: _FEC201   Course Name: Engineering Mathematics II

Time: 2 hour 30 minutes   Max. Marks: 80

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry TWO marks (20 Marks)
1.	Particular Integral of DE $(D^3 + 3D^2 - 4)y = e^x$ is
Option A:	$xe^x/9$
Option B:	$xe^x/2$
Option C:	$-xe^x/9$
Option D:	$xe^x/6$
2.	The solution of the differential equation $\left(x + \frac{e^x}{y}\right)dx - \frac{e^x}{y^2}dy = 0$ is
Option A:	$\frac{x^2}{2} + \frac{e^x}{y} = c$
Option B:	$\frac{x^2}{3} + \frac{e^x}{y} = c$
Option C:	$\frac{x^3}{2} + \frac{e^x}{y} = c$
Option D:	$\frac{x^2}{2} + \frac{xe^x}{y} = c$
3.	The value of $\int_0^\infty x^5 e^{-x^2} dx$ is
Option A:	0
Option B:	1
Option C:	1/2

Option D:	π
4.	The value of I = $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dy\, dx$ is
Option A:	$\frac{3}{35}$
Option B:	$\frac{3}{15}$
Option C:	$\frac{1}{35}$
Option D:	$\frac{3}{5}$
5.	The value of $\int_0^{\pi/2} \int_0^{a\cos\theta} \int_0^{r/\cos\theta} dz\, dr\, d\theta$ is
Option A:	0
Option B:	$\frac{a^2}{8}$
Option C:	$\frac{a^3}{3}$
Option D:	$\frac{a^2}{2}$
6.	The Integrating Factor of DE $(x^2 e^x - my)dx + mx\, dy = 0$ is given by
Option A:	$\frac{1}{y^2}$
Option B:	$\frac{1}{x^2}$
Option C:	$-\frac{1}{y^2}$
Option D:	$-\frac{1}{x^2}$
7.	Find the complementary function of $\frac{d^4y}{dx^4} + \frac{5\, d^2y}{dx^2} + 4 = x\sin x$
Option A:	$y = C_1 \cos x + C_2 \sin x + C_3 \cos 3x + C_4 \sin 3x$
Option B:	$y = C_1 \cos x + C_2 \sin x + C_3 \cos 2x + C_4 \sin 2x$

Option C:	$y = C_1 \cos xi + C_2 \sin xi + C_3 \cos 2xi + C_4 \sin 2xi$
Option D:	$y = (C_1 + C_2 x) \cos x + (C_3 + C_4 x) \sin 2x$
8.	Changing the order of integration in double integral $\int_0^2 \int_0^{4-x^2} f(x,y)dydx$ leads to $\int_a^b \int_c^d f(x,y)dxdy$ then value of 'd' is
Option A:	$4 - y$
Option B:	$2 - y$
Option C:	$\sqrt{4-y}$
Option D:	0
9.	The length of the straight line $y = 2x + 5 \; from \; x = 1 \; to \; x = 3$ is given by
Option A:	$\sqrt{5}$ units
Option B:	$3\sqrt{5}$ units
Option C:	$4\sqrt{5}$ units
Option D:	$2\sqrt{5}$ units
10.	Evaluate: $\int_0^{log2} \int_0^x \int_0^{x-y} e^{x+y+z} \, dzdydx$
Option A:	$2\log2 - \dfrac{5}{4}$
Option B:	$2\log2 + \dfrac{5}{8}$
Option C:	$\log2 - \dfrac{5}{4}$
Option D:	$2\log2 - \dfrac{1}{4}$

Q2.	**Solve any Four out of Six (5 marks each)** **(20 Marks)**
A	Solve the DE $(2xy \cos x^2 - 2xy + 1)\, dx + (\sin x^2 - x^2)\, dy = 0$
B	Solve $\dfrac{d^2 y}{dx^2} + 3\dfrac{dy}{dx} + 2y = \sin(e^x)$
C	Prove that $\int_0^\infty \dfrac{1-\cos ax}{x} e^{-x}\, dx = \dfrac{1}{2}\log(1 + a^2)$, assuming the validity of differentiation under the integral sign.
D	Change the order of integration and evaluate $\int_0^1 \int_{-\sqrt{y}}^{-y^2} xy\, dx\, dy$
E	Evaluate $\int \int \int z\, dz\, dy\, dx$, over the tetrahedron bounded by $x = 0, y = 0, z = 0$ and $\dfrac{x}{a} + \dfrac{y}{b} + \dfrac{z}{c} = 1$.
F	Find the length of the cardioid r= a(1-cosθ) lying outside the circle r = acosθ.

Q3.	**Solve any Four out of Six** **5 marks each** **(20 Marks)**
A	Solve $\tan y \dfrac{dy}{dx} + \tan x = \cos y \cdot \cos^3 x$
B	Solve the DE $(D^2 - 2D + 1)y = x^2 e^{3x}$,$where$ $D \equiv \dfrac{d}{dx}$
C	Evaluate $\int_0^\infty x^2\, 5^{-4x^2}\, dx$
D	Evaluate the integral $I = \int \int xy\,(x + y)\, dx\, dy$ over the region bounded by the curves $y = x^2$ & $y = x$.
E	Evaluate $\iiint dx\,dy\,dz$ over the solid of the paraboloid $x^2 + y^2 = 4z$ cut off by the plane z = 4
F	Find the area common to $r = a(1 + \cos\theta)$ & $r = a(1 - \cos\theta)$

Q4.	**Solve any Four out of Six** **5 marks each** **(20 Marks)**
A	Solve $xy - \dfrac{dy}{dx} = y^3 e^{-x^2}$
B	Solve $\dfrac{d^2 y}{dx^2} - y = x \sin x + \cos x$
C	Change the order of integration and evaluate $\int_0^1 \int_x^{\sqrt{2-x^2}} \dfrac{x}{\sqrt{x^2+y^2}}\, dy\, dx$
D	Evaluate $\int_0^\infty \dfrac{x^2}{(1+x^6)^{5/2}}\, dx$
E	Change to polar co-ordinates and evaluate $\int_0^1 \int_0^x x + y \;\, dy\, dx$

	F	Solve: $\dfrac{d^2y}{dx^2} - y = \dfrac{2}{1+e^x}$, using method of variation of parameters

Time: 2 hours   **Max. Marks: 60**

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry 2 marks each.
1.	Which of the following is not a property of emitted light in stimulated emission?
Option A:	Incoherent
Option B:	Unidirectional
Option C:	Monochromatic
Option D:	High Intensity
2.	In semiconductor diode laser, the lasing action takes place when the diode is _____
Option A:	Unbiased
Option B:	reverse biased
Option C:	forward biased
Option D:	in equilibrium
3.	Nanomaterials are the materials with at least one dimension measuring less than
Option A:	1nm
Option B:	10nm
Option C:	100nm
Option D:	1000nm
4.	**Maxwell's equation derived from Faraday's law is**
Option A:	$\vec{\nabla} \cdot \vec{H} = J$
Option B:	$\vec{\nabla} \cdot \vec{D} = I$
Option C:	$\vec{\nabla} \times \vec{E} = -dB/dt$
Option D:	$\vec{\nabla} \times \vec{B} = -dH/dt$
5.	An object whose length is 60m moves at a speed of 0.6 c. What is the length of the object according to a stationary observer?
Option A:	48m
Option B:	60m
Option C:	21m
Option D:	40m
6.	Calculate acceptance angle for an optical fibre whose core R.I.is 1.48 & cladding R.I.is 1.39
Option A:	10^0
Option B:	40.5^0
Option C:	30.5^0
Option D:	20^0

Q.2	Answer any 4 questions out of 6 (4 marks each)
A	Draw and explain energy level diagram for He:Ne laser. What is the role of helium atoms?
B	State and derive maxwell's equation which describes how the electric field circulates around the time varying magnetic field (Differential form).
C	Explain the concept of time dilation. A particle moving with a speed of 0.7c. Calculate the ratio of the rest mass and mass while in motion.
D	Draw the schematic diagram of Scanning Electron Microscope and explain its construction and working.
E	Diffraction grating used at normal incidence gives a line 5400 A^0 in a certain order superimposed on the violet line of 4050A^0 of the next higher order. If the angle of diffraction is 30^0, how many lines/cm are there in the grating.
F	A step index fiber has a core diameter of 29 x10^{-6} m. the refractive indices of core and cladding are 1.52 And 1.5189 respectively. If the light of wavelength 1.3 µm is transmitted through the fiber, Determine normalized frequency of the fiber. Weather fiber supports single mode or multimode.

Q.3	Answer any 4 questions out of 6 (4 marks each)
A	Explain the construction of hologram.
B	Find the divergence and curl of a vector $\vec{A} = x^2 y \,\hat{i} + (x - y) \,\hat{k}$.
C	If the kinetic energy of a body is double its rest mass energy calculate its velocity
D	Define resolving power of grating. Derive an expression for resolving power of grating.
E	Describe the physical significance of Divergence and Curl.
F	Derive the expression of numerical aperture for a step index fiber. A light ray enters an optical fiber from air. The fiber has core refractive index 1.52 and cladding refractive index 1.41. Find the Critical angle and Numerical aperture.

Q.4	Answer any 4 questions out of 6 (4 marks each)
A	Distinguish between step index and graded index optical fiber.
B	If $\phi(x,y,z) = 3x^2y - y^3z^2$, Find $\vec{\nabla}\phi$ at the point (-1, -2, 1).
C	Discuss the phenomenon of Fraunhofer's diffraction at a single slit and obtain the condition for the first minimum.
D	Summarize the postulate of special theory of relativity and write Gallialian transformation equation for velocity, position and acceleration.
E	A parallel beam of light is incident (5896 A^0) on a slit of width 0.2mm Calculate angular and linear width of central maximum formed on the screen 15cm away.
F	Explain any two methods to synthesize nanomaterials.

Course Code: FEC203   Course Name: Engineering Chemistry- II

Time: 2hour   **Max. Marks: 60**

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NOTE: **All Questions are Compulsory.**

Atomic Weights: C = 12, H = 1, O = 16, N = 14, S = 32

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I.   **Multiple Choice Questions:**

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry 2 marks each.**
1.	As per the principle of spectroscopy one of the following is the type of energy present in a molecule:
Option A:	Ultrasonic energy.
Option B:	Electronic energy.
Option C:	Solar energy.
Option D:	Geo-thermal energy.
2.	One of the following is an example, explaining principle of green chemistry of Energy efficient chemical synthesis.
Option A:	Synthesis of Carbaryl.
Option B:	Synthesis of Indigo.
Option C:	Synthesis of adipic acid.
Option D:	Synthesis of Benzimidazole.
3.	A cell is constructed from Ni+ 2 / Ni and Cu+2/Cu half cells. The standard potential of the cell is -------. Given E^0Ni = - 0.257 V and E^0Cu = 0.337 V
Option A:	0.594 V.
Option B:	0.008 V.
Option C:	- 0.594 V.
Option D:	- 0.008 V.
4.	Nobel metals do not undergo oxidation corrosion because it forms_____
Option A:	Unstable oxide film.
Option B:	Non-porous oxide film.
Option C:	Porous stable film.
Option D:	Volatile oxide film.
5.	A sample of coal has following composition by mass C =70 %, O = 8 %, H = 10 %, N = 3 %, S = 2%, Ash = 7 %. Calculate H.C.V. using Dulong's formula
Option A:	8277.80 kcal/kg.
Option B:	8805.80kcal/kg.
Option C:	8877.80 kcal/kg.
Option D:	8205.80 kcal/kg.
6.	Coating of tin on iron is an example of ………………
Option A:	Anodic coating.
Option B:	Cathodic coating.
Option C:	Galvanizing.
Option D:	Sherardizing.

II. Descriptive Questions:

Q2	Solve any Four Questions out of Six:	4 Marks each
A	Define Spectroscopy. Also explain the origin of spectrum with diagram.	
B	The standard emf of the following cell is 0.462 V. Cu(s)/ Cu^{+2} (aq)(1M)// Ag$^+$(aq)(1M)/ Ag(s) Write the cell reaction. If the standard potential of Cu electrode is 0.337 V, what is the standard potential of Ag electrode?	
C	What is the principle of cathodic protection? What are the two types of cathodic protection? Discuss any one with the help of a suitable diagram.	
D	Explain how corrosion of iron article takes place in acidic medium.	
E	Calculate the percentage atom economy for the following reaction with respect to cinnamaldehyde. C_6H_5CHO + CH_3CHO → $C_6H_5CH\text{-}CHCHO$ + $H2O$ Given Atomic Weights: C = 12, H = 1, O = 16.	
F	What are 'oxygenates' used in the fuel industry? Where and why are they added? Explain by giving examples.	

Q3	Solve any Four Questions out of Six:	4 Marks each
A	Explain the conventional and green route of manufacturing indigo dye. Mention the green chemistry principles involved.	
B	What is a Reference electrode? Explain any one Reference electrode with suitable diagram and representation.	
C	Give the classification of spectroscopy on atomic and molecular basis (Tree Diagram). Explain the selection rule no.2. $\Delta l = +\,\text{-}\,1$ of spectroscopy for electron transitions.	
D	By Kjeldahl's method 3 gm of coal sample was analyzed. The ammonia evolved was absorbed in 40 ml of 0.5 N H2SO4. After absorption, the excess H_2SO_4 required 18.5 ml of 0.5N KOH for neutralization. A coal sample was subjected to ultimate analysis 2.45 g of coal on combustion in a Bomb-Colorimeter gave 0.67 of BaSO4. Calculate percentage of Nitrogen and Sulphur.	
E	Explain Differential aeration corrosion with diagram and reactions.	
F	Calculate the minimum weight and volume of air required for the complete combustion of 1 kg of fuel containing C= 80%, H= 6%, O=8%, S= 1.5%, H2O= 1.0%, N= 1.5% and ash= rest. (Molecular weight of air = 28.94 gm).	

Q4	Solve any Four Questions out of Six:	4 Marks each
A	How do the following factors affect the rate of corrosion? (i) Relative areas of anodic to cathodic part (ii) Position of metal in galvanic series.	
B	Explain the working Catalytic converter with the help of any two chemical reactions and diagram.	
C	Give in tabular form the relation between electromagnetic spectrum, types of spectroscopy and corresponding energy changes.	
D	What is Biodiesel? Give the trans-esterification reaction of the preparation of Biodiesel and two advantages of biodiesel.	
E	Differentiate between Electrolytic and Galvanic cell.	
F	Calculate the volume of air required for complete combustion of $1m^3$ of gaseous fuel having the following composition: $CO = 5\%$, $C_2H_4 = 10\%$, $CH_4 = 40\%$, $N_2 = 2.5\%$, $H_2 = 35\%$, $CO_2 = 2\%$, $O_2 = 2.5\%$ Given Atomic Weights: $C = 12$, $H = 1$, $O = 16$, $N = 14$.	

University of Mumbai

Curriculum Scheme: Rev2019

All Programs

Examination: FE Semester I/II (keep the required) _FH2022
Course Code: FEC204

Course Name: **Engineering Drawing/Engineering Graphics**

Time: 2 hour 30 minutes   Max. Marks: 60

NOTE to the Question Paper Setter:

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=General Instructions:
  General Instructions:
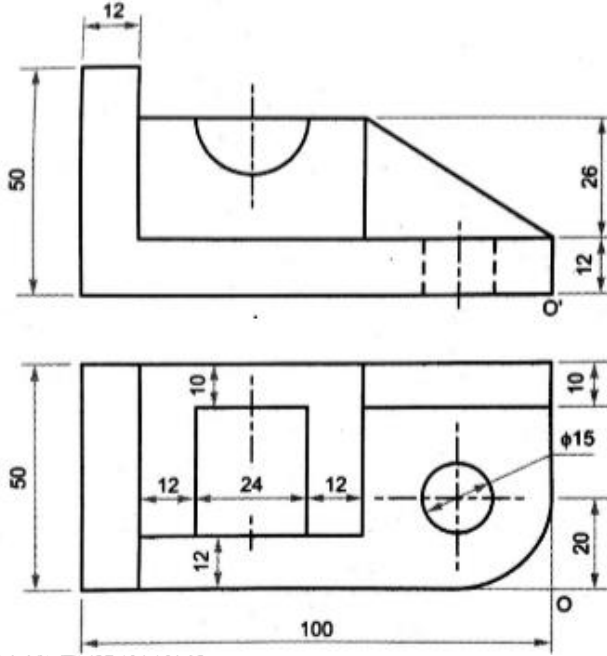*i)*   *Solve all questions.*
ii)   *All dimensions are in mm.*
iii)   *Use the first angle method of projection.*
iv)   *Assume a suitable dimension if it is necessary.*
v)   *Retain all construction lines.*
vi)   *Line work should be in such a way that the drawings are neat and clear while*
           scanning.

| Q1.		Solve any One Question out of Two	10
	a.	A line AB 65 mm long has its end A 20 mm above the H.P. and 25 mm in front of V.P. The end B is 40 mm above the H.P. and 65 mm in front of the V.P. Draw the projections of AB and shows its inclinations with the H.P. and V.P.	
	b.	One end of an inelastic string, 120mm long, is attached to the Circumference of a circular disk of 50mm diameter. The free end of the string is wound around the disc, keeping the string always tight. Draw the locus of the free end and name the curve.	
Q2.		Solve any One Question out of TWO	15
	a.	A square prism, side of base 30 mm and axis length 60 mm is kept on the H.P. on a corner of its base such that its axis makes an angle of 30 degrees to H.P. Draw the projections of the prism.	
	b.	Fig. shows Pictorial view of an object. Draw the following views i) Front view ii) Top view	
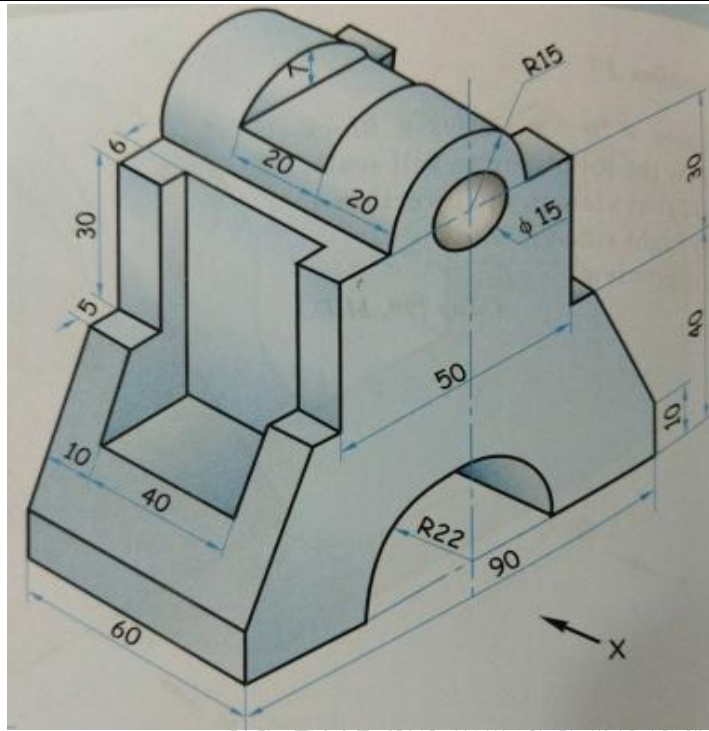
Q3		Solve any One Question out of TWO	15
	a.	Draw Isometric view of the given FV and TV. 	
	b.	A pentagonal pyramid, 40mm edge of the base and axis height 70mm is resting on one of its corner of base on H.P. The edge opposite to the corner is parallel to and 45mm above H.P. and is parallel to V.P. Draw the projection when apex is nearer to V. P.	
Q4.		Fig. shows a pictorial view of an object. Draw i) Sectional front view along section plane A-A ii) Top view iii) Left hand side view	20
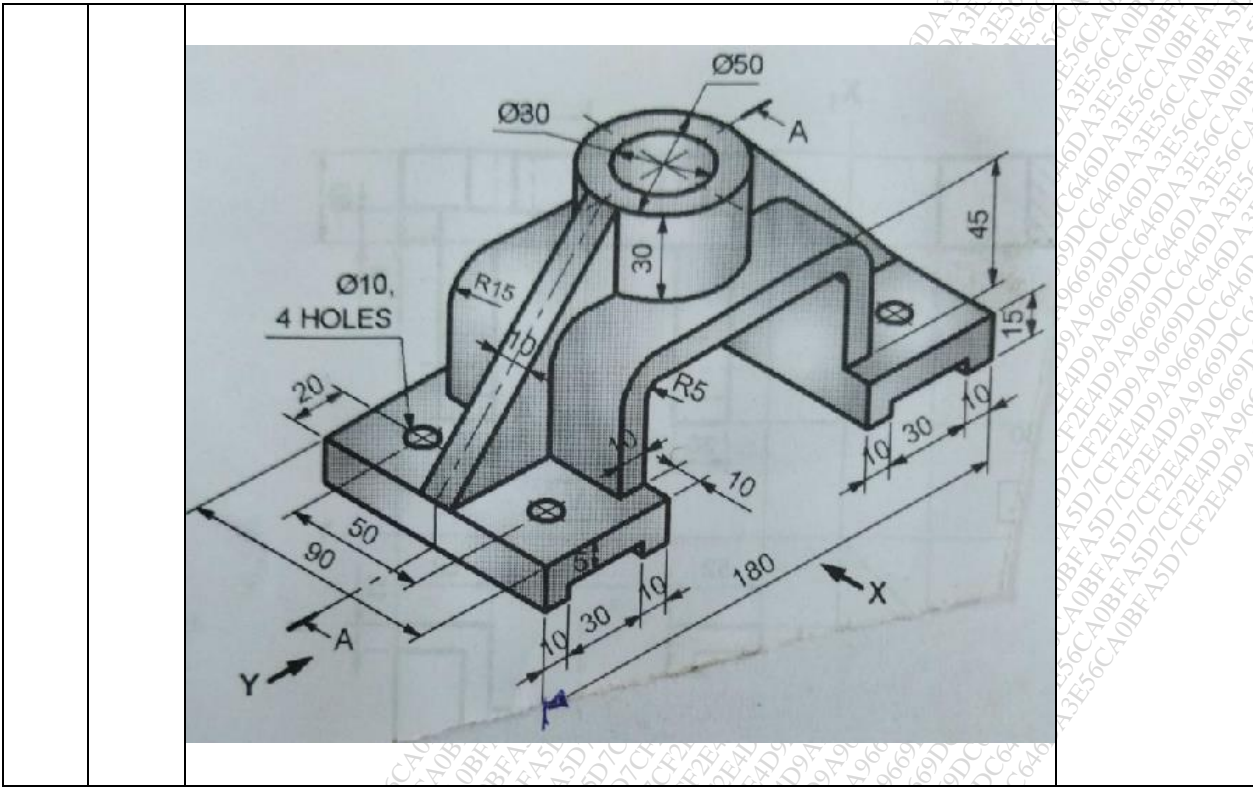
Time: 2 hours   **Max. Marks: 60**

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks. (2 Marks each)
1.	What inbuilt function should be used to return a value rounded up to the next higher integer?
Option A:	floor( )
Option B:	round( )
Option C:	puts( )
Option D:	ceil( )
2.	Collection of variables of same or different data types is called as
Option A:	Array
Option B:	Structure
Option C:	Function
Option D:	String
3.	What is value of **a** in following expression? int a = 10 + 4.867;
Option A:	a=10
Option B:	a=14.867
Option C:	a=14
Option D:	a=4

4.	```#include <stdio.h>```
	``` void main()```
	``` {```
	``` int x = 5;```
	``` if (x == 5)```
	``` printf("hi\n");```
	``` else```
	``` printf("how are u\n");```
	``` printf("hello\n");```
	``` }```

Option A:	hi
Option B:	hi hello
Option C:	how are you hello
Option D:	how are you
5.	The value obtained in the function is given back to the main program by using which keyword?
Option A:	new
Option B:	return
Option C:	volatile
Option D:	static

6.	In an array a[2] [2] = {10,20,30,40,50,60}, then a[0] [1] is which element?
Option A:	10
Option B:	20
Option C:	30
Option D:	40

Q2	Solve any Four out of Six (4 marks each)
A	Explain conditional operator used in C language with proper example.
B	Differentiate between entry and exit controlled loop with an example.
C	Write a program to accept a number and to check whether it is Armstrong number or not. (If sum of cube of digits equal to that number then number is Armstrong number. example $1^3+5^3+3^3 =153$)
D	Define recursion. Write a program using recursive function 'power' to compute x raised to n i.e. x^n which can be defined as given below: power (x, n)=1 if n=0 power(x, n)=x if n=1 power(x, n)=x*power(x,n-1) otherwise
E	Explain following functions with proper example. a) strcmp( ) b) strcat( ) c) gets( ) d) strrev( )
F	Write a program to accept elements of one dimensional array from user and sort and display them in ascending order.

Q3	Solve any Four out of Six (4 marks each)
A	Explain bitwise operators available in C?
B	Write a program to print the following pattern. Accept number of rows from user and display that much number of rows in output. 1 01 101 0101
C	Write a program to find factorial of a given number using function.
D	Explain compile time and run time initialization of an array with proper example.
E	Write a program to accept elements of two dimensional square matrix and check whether matrix is symmetric or not.
F	Write a program to read Title, Author and Price of 5 books using array of structures. Display the records in ascending order of Price.

Q4	Solve any Four out of Six (4 marks each)
A	Explain data type modifiers available in C language.
B	Write a program to accept three numbers and to find largest of three numbers using nested if-else.
C	Write a program to check whether the entered string is palindrome or not using user defined function.
D	Explain the following with proper example: a) break b) continue c) goto
E	Explain the advantages of using Function.
F	Distinguish between Structure and Union with proper example.

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Curriculum Scheme: Rev2019 'C Scheme'

Examination: FE Semester II _FH2022

Course Code:29716   Course Name: Professional Communication and Ethics-I

Time: 1 hour 30 minutes   Max. Marks: 40

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Q 1Solve MCQ   10 Marks (2 Marks each)

1. Mention the color in which each of these is mentioned.
Option A: Caution
Option B: Warning
Option C: Danger
Option D: Note

2. A voltmeter is an ………………………that measure voltages.
Option A: tool
Option B: instrument
Option C: appliance
Option D: equipment

3. The key to all communication is
Option A: Sender
Option B: Receiver
Option C: Medium / channel
Option D: Feedback

4. SQ3R Method helps one to become an effective……………….
Option A: Writer
Option B: Reader
Option C: Listener
Option D: speaker

5. The term Kinesics stands for-
Option A: Facial expression
Option B: Space
Option C: Body Language
Option D: Time

Q-2 Attempt any two questions-   10 Marks

1

Q2 (A)
    i. What is meant by communication? Discuss the process of communication in detail.(03)
    ii. Write short note on-(02)
        1.   E-mail Etiquette
        2.   Occulesics

Q-2 (B)

(i)Tata Merchants, Mumbai had ordered 70 bags of rice and 50 bags of wheat from Shah Bros. Nashik. Write a letter of complaint for the shortage of 30 rice bags and 5 wheat bags. Give full details of the shortage and claim compensation (use full block format) (04)

 ii. Do as directed: (01)

    i. The exam was ………………………… than I thought. (Use the comparative form of easy)
    ii. The factory is located near the ……………………….region (desert/dessert).

Q-2 (C)

i. What are 7 Cs of business correspondence? Explain the ways in which clarity can be (03)
  achieved in business letters?

    ii. Construct the technical definition of the following- (02)
        1. Voltmeter
        2. Lathe

Q-3 Attempt any two questions-

    (A) 1. What is Grapevine? Discuss the merits and demerits of Grapevine in an organization. (03)

        2. Write short note on Paralanguage. (02)

Q-3 (B) Write technical description of a 'Computer' or 'Water purifier' under the following headings. (05)
        1. Definition
        2. Diagram
        3. Description of components
        4. Working

Q-3 (C) 1.Compare and contrast between oral and written communication. (03)

        2. What is the difference between Technical Description and Instruction? (02)

2

Q-4 Attempt any two questions-

(A) Read the following passage and answers the given questions- (05)

There is no dearth of fake patriotism in the world to camouflage one's weakness or failure in administration and planning. It rather becomes an instrument in the hands of dictators and selfish rulers to keep their position safe. One can hear the slogans of Patriotism on both the sides of the line of demarcation in the Indian sub-continent. When there is satisfaction among the masses there slogans would be raised 'danger is lucking on the borders ' , 'the enemy is making preparations to attack one country'. This is not patriotism but perverse thinking for selfish motives. Patriotism does not require a whip to rouse the sentiments of the people- if it is true Patriotism. The Unity achieved during war maybe a result of apprehension of slavery, not necessarily true emotion generated by Patriotism. It is in the blood of people to mould their life according to the needs of the motherland. It is not expedient to create circumstances benefiting one's own interests. It is rather regrettable that Patriotism is a greatest casualty in almost all the fields in our country. Political expediency and selfish motives have becomes Supreme, to the extent that even to talk of Patriotism is labelled as puerile or reactionary. Let us take inspiration from the young girl who wept and cried bitterly for she could not offer flowers on the war memorial in London, for none of her forefathers had laid his life for the cause of the nation. Let us inculcate this novel spirit among the people if we have to bring back the glory that was India.

Questions:
1. What is the effect of fake patriotism? (01)
2. When are the slogans of patriotism raised? (01)
3. What does the author regret? (01)
4. What is the result of political expediency and selfish motives? (01)
5. Give the synonyms for the followings: (01)
   (i) Apprehension of slavery
   (ii) Political expediency

Q-4 (B)
1. Write set of instructions for using "Washing machine" or "Replacing gas cylinder". (03)
2. What is "You Attitude"? Explain with example. (02)

Q-4 (C)
1. As a Sale Director of Fitness Plus Centre, Bangalore, draft a sales letter to (04)
   Business professions selling them your 3 wellness packages: (use full block format)
   i) The 3 day Fitness weekend.
   ii) The 7 day Total Fitness Programme.
   iii) The Individualized corporate well- being programme.

2. Differentiate between Caution and warning. (01)

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