1E3101

Total No. of Questions : 22 Total No. of Pages : 04

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1E3101

B.Tech. I sem(Main/Back) Exam 2024

1FY2-01 / Engineering Mathematics-I

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in Form No. 205)

1. ..... 2. .....

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. What is the value of integral $\int_0^\infty e^{-x^2} dx$?

Q.2. Write the formula of surface area of solid of revolution when the revolution is about x-axis.

Q.3. What do you mean by convergence of a sequence?

Q.4. Find whether the following series is convergent or not?

$$\frac{1}{2.3}+\frac{1}{3.4}+\frac{1}{4.5}+\ldots$$

Q.5. State Parseval's theorem.

Q.6. Find the value of a_0 for the function $f(x)=|x|$ in the interval $(-\pi,\pi)$.

Q.7. State the necessary and sufficient conditions for the minimum of a function $f(x,y)$.

Q.8. Find the gradient of $f(x,y,z)=x^2y^2+xy^2-z^2$ at (3, 1, 1).

Q.9. Evaluate $\int_0^b\int_0^x xydxdy$.

Q.10. State the Gauss Divergence theorem.

PART - B

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Use beta and gamma functions, to evaluate :

$$\int_0^\infty \frac{x^2(1+x^4)}{(x+x)^{10}}dx.$$

Q.2. Expand sin x in the powers of $(x-\pi/2)$ using Taylor's series.

Q.3. Find Fourier series of x^2 in $(-\pi,\pi)$, and use Parseval's identity to prove :

$$\frac{\pi^4}{90} = 1 + \frac{1}{2^4} + \frac{1}{3^4} + \ldots$$

Q.4. If $u = e^{xyz}$, then show that :

$$\frac{\partial^3 u}{\partial x \partial y \partial z} = (1 + 3xyz + x^2y^2z^2)e^{xyz}$$

Q.5. Whether the fluid motion given by $V = (y+z)i + (z+x)j + (x+y)k$ is incompressible or not?

Q.6. Change the order of integration and hence evaluate :

$$\int_0^1 \int_{e^x}^{e} \frac{1}{\log y} dxdy .$$

Q.7. Evaluate $\int_1^2 \int_1^z \int_0^{yz} (xyz) dxdydz.$

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

Q.1. Use beta and gamma functions, to evaluate :

(a) $\int_0^{\infty} \frac{x}{1+x^6} dx.$

(b) $\int_0^1 \sqrt{\left(\frac{1-x}{x}\right)} dx.$

Q.2. Find the Fourier series expansion of the following periodic function with period 2π.

$$f(x)=\begin{cases} -1, & -\pi<x<0 \\ 0, & x=0 \\ 1, & 0<x<\pi \end{cases}$$

Hence, show that $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\ldots=\frac{\pi}{4}$.

Q.3. Use Lagrange's method to find the maximum and minimum distance of the point (3, 4, 12) from the sphere $x^2+y^2+z^2=1$.

Q.4. If $u=f(r)$, where $r^2=x^2+y^2$, then prove that :

$$\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=f''(r)+\frac{1}{r}f'(r).$$

Q.5. Verify Green's theorem for $\int_C\left[(xy+y^2)dx+x^2dy\right]$, where C is the closed curve of the region bounded by $y=x$ and $y=x^2$.

1E3102

Total No. of Questions : 22 Total No. of Pages : 04

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1E3102

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY2-02/Engineering Physics

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART-A **[10×2=20]**

(Answer should be given upto 25 words only)

All questions are compulsory

Q.1. Give the physical significance of divergence and curl of a field.

Q.2. Write all four Maxwell's equations in integral form for free space.

Q.3. What do you mean by eigenfunctions and eigen values?

Q.4. When the movable mirror of Michelson's interferometer is shifted by 0.030 mm, the shift of 100 fringes is observed. Calculate the wavelength of light in $\mathring{A}$ and state its colour.

Q.5. State Rayleigh's criterion of resolution.

Q.6. Find the lowest energy of an electron confirmed to move in one dimensional potential box of length 1 $\mathring{A}$.

Q.7. Calculate the numerical aperture and acceptance angle of an optical fiber. Given refractive index of fiber core=1.62 and refractive index of cladding=1.52.

Q.8. Define spatial and temporal coherence.

Q.9. What do you mean by stimulated emission and spontaneous emission?

Q.10. The carrier concentration in n-type semiconductor 10^{19} per m^3. What is the value of Hall coefficient?

PART-B [5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Give the construction and theory of plane transmission grating and explain the formation of spectra by it.

Q.2. Prove that in high frequency region laser action is not possible.

Q.3. For intrinsic semiconductor with a band gap E_g=0.7 eV, calculate the density of electrons and holes at 300K.

Q.4. A ray of light entres from air into fiber. The refractive index of air is one. The fiber has a core of refractive index 1.5 and cladding of refractive index 1.48. Find the critical angle, the fractional refractive index, acceptance angle and numerical aperture.

Q.5. A plane transmission grating of length 6 cm has 5000 lines/cm. Find the resolving power of grating and the smallest wavelength difference that can be resolved for light of wavelength 5000 $\mathring{A}$.

Q.6. If a potential function is given by the expression , $\phi = xyz$, determine the potential gradient and also prove that the vector is irrotational.

Q.7. Calculate the angles at which the first dark band and the next bright band are formed in the Fraunhofer diffraction pattern of a slit 0.3 mm wide ($\lambda = 5890\ \mathring{A}$).

PART-C **[3×10=30]**

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any three questions

Q.1. In a Newton's ring arrangement with air film observed with light of wavelength 6×10^{-5} cm, the difference of squares of diameters of successive rings is 0.125 cm^2. What will happen to this quantity if :

(i) Wavelength of light is changed to 4.5×10^{-5} cm.

(ii) A liquid of refractive index 1.33 is introduced between the lens and the plate

(iii) The radius of curvature of the convex surface of the Plano-convex lens is doubled?

Q.2. Explain the terms : Population inversion and optical pumping. Discuss with suitable diagrams the principle, construction and working of Helium-Neon Laser.

Q.3. The Hall voltage for the sodium metal is 0.001 mV, measured at I=100 mA, B=2 Tesla, the width of the specimen=0.05 mm and $\sigma = 2.09 \times 10^7 \Omega^{-1} m^{-1}$,

(a) calculate the number of carriers per cubic meter in sodium.

(b) calculate the mobility of electrons in sodium.

Q.4. State and prove Poynting theorem for the rate of flow of energy in electromagnetic field. What is Poynting vector?

Q.5. Give physical significance of wave function. Derive time dependent and time independent Schrödinger wave equation.

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1E3103

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY2-03/Engineering Chemistry

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART-A **[10×2=20]**

(Answer should be given upto 25 words only)

All questions are compulsory

Q.1. Hardness of a given water sample is 250 ppm. Express the hardness in degree Clarke and degree French. [2]

Q.2. What do you understand by Break Point Chlorination. [2]

Q.3. The Gross calorific value of a coal sample is 9650 kcal/kg. Calculate the Net calorific value if it contains 6% hydrogen. (latent heat of steam = 587 kcal/kg). [2]

Q.4. What is synthetic petrol? Name the two methods used to convert coal to gasoline. [2]

Q.5. Under identical conditions why does impure metal corrode faster than pure metal? [2]

Q.6. What is 'Flash set' of cement the name the compound responsibel for it. [2]

Q.7. What do you understand by annealing of glass and what is its significance? [2]

Q.8. What is Steam Emulsion Number of a lubricant?

Q.9. Why anodic coatings are better than cathodic coatings for corrosion control? [2]

Q.10. What type of addition reactions occur in carbonyl compounds and why? [2]

PART-B [5×4=20]

(Analytical/Problem Solving Questions)

Attempt any five questions

Q.1. Calculate the amount of lime and soda required to soften 10,000L of a water sample containing the following impurities : [4]

$Ca(HCO_3)_2$ = 16.2 mg/L; $Mg(HCO_3)_2$ = 14.6 mg/L; $CaSO_4$ = 13.6mg/L;

$MgSO_4$ = 12.0 mg/L; $MgCl_2$ = 9.5 mg/L.

Q.2. Define knocking. Explain the phenomenon of knocking in a petrol engine. [1+3]

Q.3. What is Pitting corrosion? Explain the mechanism. [1+3]

Q.4. Define cloud and pour point of a lubricating oil. How can you determine the cloud and pour point of a lubricating oil, explain with the help of a well labeled diagram. [1+3]

Q.5. Describe the synthesis, properties and uses of Paracetamol. [4]

Q.6. Explain the following : [2+2=4]

(a) Role of gypsum in cement

(b) Borosilicate glass

Q.7. What is Proximate analysis of fuel and what is its significance? [3+1]

PART-C [3×10=30]

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

Q.1. (a) What do you understand by Priming and Foaming? [5]

(b) 0.5g of $CaCO_3$ was dissolved in HCl and the solution was made upto 500 mL with distilled water. 50 mL of this water sample required 48 mL of EDTA solution for titration. 50 mL of the sample water required 15 mL of EDTA and 50 mL of boiled water sample required 10 mL of EDTA solution for titration. Calculate the temporary, permanant and total hardness of the given water sample. [5]

Q.2. (a) Explain the determination of calorific value of a fuel using a Bomb Calorimeter. [5]

(b) A sample of coal contains the following constituents :

C = 88%; H = 4%; O = 4%; N = 2%; S = 2%

Calculate the minimum weight of air required for the complete combustion of 1 kg of this coal sample. [5]

Q.3. (a) Explain the mechanism of chemical (dry) corrosion. [5]

(b) Explain the sacrificial anode cathodic protection method for corrosion control. [5]

Q.4. Write short notes on : [5+5]

(a) Manufacture of cement by Rotary kiln method

(b) Classification of Lubricants

Q.5. Explain the mechanism of : [5+5]

(a) Electrophilic aromatic substitution in benzene

(b) Nucleophilic substitution reaction in t-butylbromide. Also discuss the stereochemistry of the product.

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1E3104

Total No. of Questions : 22 Total No. of Pages : 04

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1E3104

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY1-04 / Communication Skills

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly. Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. ..... 2. .....

PART-A

(Answer should be given upto **25** words only)

All questions are compulsory

[10x2=20]

Q.1. Name the author of the short story "The Luncheon".

Q.2. Give the main similarities between Formal and Informal Communications.

Q.3. Mention two implications of Communication Gap.

Q.4. How do you categorize different types of Reported Speech? Give one example of each type.

Q.5. Name the various types of Conjunctions, giving suitable example of each type.

Q.6. What are the 4 types of Business Letters?

Q.7. What is the meaning of resume?

Q.8. What is the theme of the poem "No Men Are Foreign"?

Q.9. What do you know about the vision, Rabindranath Tagore had for a free and sovereign country?

Q.10. Mention the Divisions of Human Communication in short.

PART-B

(Analytical / Problem solving questions)

Attempt **any five** questions

[5x4=20]

Q.1. Change the sentences into indirect speech :

(i) "I worked as a waiter before becoming a chef," he said.

(ii) "I had a headache yesterday," she said.

(iii) "Don't play in the dark, boys," the teacher said.

(iv) "Where do you stay?" she asked him.

(v) "Have you got a mobile?" she says to her friend.

(vi) "Have you been to Jaipur before?" said the interviewer.

(vii) The beggar said, "Please help me".

(viii) The manager said to his secretary, "Would you mind coming early tomorrow?"

Q.2. Fill in the blanks :

(i) If it had rained, you _____ (wet).

(ii) I would have believed you, if _____ (lie, not) to me before.

(iii) If I study hard, I _____ (ace) this test.

(iv) If the weather _____ (be) good, our crops will flourish.

(v) If it rains on Saturday, the picnic _____ (be) cancelled.

(vi) If the weather is nice, the children usually _____ (walk) to school.

(vii) If you get a final mark of less than 80%, you _____ (pass, not) the level.

(viii) If I hadn't come to the USA to study, I _____ (make, not) so many friends from other countries.

Q.3. You are Vinod/Vinita of Rajasthan Technical University, Kota. Recently, your institute celebrated its Silver Jubilee. Write a report in 150-200 words for your magazine describing the various programmes arranged in your institute for the celebration.

Q.4. Write a Paragraph on any one of the following : A Visit to the Book Fair or Environmental Degradation. (120 - 150 words)

Q.5. You are Sumit Sharma, a Delhi University Science graduate. You're looking for suitable work. You saw an advertisement in the Hindustan Times looking for young and vibrant fresh graduates to work as sales assistants in a reputable firm. Prepare your resume.

Q.6. Describe in detail the main theme of the poem "If" by Rudyard Kipling mentioning the need for inculcating good qualities to become a 'man'.

Q.7. Give a detailed gist of the story "How Much Land Does a Man Need?" highlighting the impact of greed on human behaviour.

PART-C

(Descriptive/Analytical/Problem solving/ Design questions)

Attempt **any three** questions

[3x10=30]

Q.1. What do you mean by Communication? What is the importance of communication in a professional career? Explain the process of communication with a suitable example.

Q.2. Explain the advantages and disadvantages of Verbal Communication in detail.

Q.3. What are Modal Verbs? How many types of modal verbs are there? Describe giving examples.

Q.4. How did the author react when he saw the girl for the first time? What do you think about the end of the story "The Night Train"?

Q.5. As the Proprietor of Fancy Garment Showroom, Kota write a business letter to M/s Jenny and Jonny about their range of teenager's wear and variety they can provide you. Invent all necessary details.

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1E3105

Total No. of Questions : 22 Total No. of Pages : 03

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1E3105

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY1-05 / Human Values

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART-A **[10x2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. How are values and skills related to each other?

Q.2. Differentiate between belief and understanding.

Q.3. How are wealth and prosperity differentiated?

Q.4. What is our basic aspiration?

Q.5. What is the comprehensive human goal?

Q.6. How are technology and values related?

Q.7. Define the term justice.

Q.8. What does universal human order mean?

Q.9. State the meaning of definitiveness of ethical human conduct.

Q.10. Differentiate between glory and gratitude.

PART-B

[5x4=20]

(Analytical/Problem solving questions)

Attempt any Five questions

Q.1. Discuss the concept of Sanyam and Swasthya.

Q.2. Explain the importance of right understanding for mutual fulfillment and mutual prosperity.

Q.3. Discuss the basic guidelines for value education.

Q.4. What are the problems that we face today due to preconditioned desires, thoughts and selections?

Q.5. Differentiate between animal consciousness and human consciousness.

Q.6. 'Trust is the foundation value in relationship.' Explain.

Q.7. Examine the issues in professional ethics in current scenario.

PART-C [3x10=30]

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

Q.1. Self-exploration is the process of dialogue between what you are and what you really want to be. Discuss.

Q.2. Existence = nature submerged in space. Explain.

Q.3. Discuss the broad holistic criteria for the evaluation of technologies, production system and management models.

Q.4. Critically examine the needs and activities of self and body.

Q.5. Discuss the need for value education in technical institutes.

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1E3106

Total No. of Questions : 22 Total No. of Pages : 03

Roll No. : .....

1E3106

B.Tech. I-Sem. (Main/Back) Exam. - 2024

IFY3-06 / Programming for Problem Solving

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART-A **[10x2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. With the help of diagram, explain how RAM, ROM and CPU interact with each other.

Q.2. Explain how read/write operation is carried out in an optical disk.

Q.3. What do you understand by software? Discuss its types.

Q.4. Define Flowchart. List any important reason for using flowcharts.

Q.5. What are the advantages and disadvantages of using a Pseudocode?

Q.6. Show by an example that we can subtract both positive and negative number by 2's complement Arithmetic?

Q.7. Why is C language called Middle Level Language?

Q.8. What is dynamic initialization?

Q.9. Differentiate Excess-3 BCD and Common BCD with suitable example.

Q.10. Find out the 7's complement of this number : $(157)_8$.

PART-B **[5x4=20]**

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Discuss the various computer generation along with the key characteristics of the computers of each generation.

Q.2. Explain stored program concepts. Discuss the architecture of stored program computers.

Q.3. Explain program development lifecycle with the help of a block diagram.

Q.4. Explain the features of Good Programming Language.

Q.5. What is the difference between Interpreter and Compiler?

Q.6. Find out the value of X in this conversion: $(520)_8=(150)_x$

Q.7 What is the difference between %f and %g format specifiers?

PART-C **[3x10=30]**

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

Q.1. What do you understand by Central Processing Unit (CPU)? Describe in detail the various units of computer system.

Q.2. Explain the procedure for executing a C program with flowchart.

Q.3. Solve the following:

(a) $(253)_8 + (157)_8$

(b) $(E010)_{16} - (DFFF)_{16}$

(c) $(1010)_8 = (?)_2$

(d) $(FEF)_{16} = (?)_8$

Q.4. Write a program to read a three digit positive integer number n, and generate possible permutation of numbers using the digits in a number.

For example: if n= 123, then the permutations are 123,132,213,231,312,321.

Q.5. Write a program to display number from 1 to 100. Redirect the output of the program to text file.

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1E3107

Total No. of Questions : 22 Total No. of Pages : 03

Roll No. : .....

1E3107

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY3-07/Basic Mechanical Engineering

Time : 3 Hours Maximum Marks : 70

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and three questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly. Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART-A **[10x2=20]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. State the Zeroth law of thermodynamics.

Q.2. Discuss the two important properties of Steam.

Q.3. What are the main components of IC engine?

Q.4. What is meant by priming in centrifugal pumps?

Q.5. Define the performance measure of a refrigerator and a heat pump.

Q.6. Why gear drive is called as positive drive?

Q.7. List the different fields of mechanical engineering.

Q.8. What is the difference between open belt and cross belt?

Q.9. Give the name of four types of patterns.

Q.10. What is 18:4:1 steel? State its application.

PART-B **[5x4=20]**

(Analytical/Problem solving questions)

Attempt any five questions

Q.1. Explain the second law of thermodynamics. Is it possible for a heat engine to operate without rejecting any waste heat to a low temperature reservoir? Explain.

Q.2. Discuss the classification of the Steam Boilers. Explain the working of any boiler with the neat sketch.

Q.3. Derive an expression for the air standard efficiency of Otto cycle. Draw neat P-V and T-S diagrams.

Q.4. Differentiate among the welding, brazing and soldering.

Q.5. Compare the working of two stroke and four stroke Internal Combustion Engine.

Q.6. Derive an expression for the ratio of tensions in a V-belt drive.

Q.7 Discuss the following manufacturing processes:

(a) Rolling

(b) Extrusion

PART-C **[3x10=30]**

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any three questions

Q.1. Explain the oxy-acetylene gas welding and metal arc welding with neat sketches. Also state their applications.

Q.2. Explain the working of a reciprocating pump with neat sketch.

Q.3. Find the power transmitted by a belt running over a pulley of 500 mm diameter at 300 rpm. The coefficient of friction between the belt and pulley is 0.24, angle of lap is 150° and maximum tension in the belt is 2.45 kN.

Q.4. Explain the following:

(a) Vapour compression refrigeration cycle

(b) Comfort air conditioning

Q.5. Write a short note on **any two** of the following:

(a) Classification of IC engines

(b) Forging manufacturing process

(c) Various engineering materials and their properties

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1E3108

Total No. of Questions : 22 Total No. of Pages : 04

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1E3108

B.Tech. I-Sem. (Main/Back) Exam. - 2024

IFY3-08 / Basic Electrical Engineering

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

1. ..... 2. .....

PART-A

(Answer should be given upto **25** words only)

All questions are compulsory

[10x2=20]

Q.1. State the relationship between line voltage and phase voltage and line current and phase current of a 3-phase delta connected system.

Q.2. Define Apparent power and Power factor.

Q.3. Why transformers are rated in kVA?

Q.4. Give the emf equation of a transformer and define each term.

Q.5. An 1100/400 V, 50 Hz single phase transformer has 100 turns on the secondary winding. Calculate the number of turns on its primary winding.

Q.6. Write down the expression of equivalent resistance for 'n'-number of resistors in parallel connection.

Q.7. Write the algorithm for Nodal Analysis.

Q.8. Distinguish between induction motor and synchronous motor.

Q.9. Draw the V-I characteristics of an ideal diode.

Q.10. Give some method available for measuring 3-phase power.

PART-B

(Analytical / Problem solving questions)

Attempt **any five** questions

[5x4=20]

Q.1. An alternating voltage is given by $V=230\sin 314t$. Calculate :

(i) Frequency

(ii) Maximum value

(iii) Average value

(iv) RMS value

Q.2. State Thevenin's theorem and give a proof. Apply this theorem to calculate the current passing through the 4Ω resistor of the circuit of Fig.1

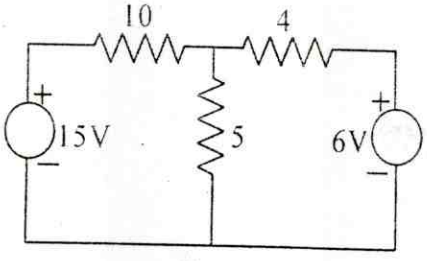

Fig. 1

Q.3. Determine the power factor of a RLC series circuit with R = 5 ohm, X_L=8 ohm and X_C = 12 ohm.

Q.4. With a neat diagram explain the working of a PN junction diode in forward bias and reverse bias and show the effect of temperature on its V-I characteristics.

Q.5. List out the characteristics of DC motor.

Q.6. Derive an expression for conversion of a resistive network from star to delta.

Q.7. What is working of BJT? Draw its equivalent circuit.

PART-C

(Descriptive/Analytical/Problem solving/ Design questions)

Attempt **any three** questions

[3x10=30]

Q.1. Explain with sketches the constructional features and working of a synchronous generator.

Q.2. In a series circuit containing pure resistance and a pure inductance, the current and the voltage are expressed as :

$$i(t) = 5\sin\left(314t + \frac{2\pi}{3}\right) \text{ and } v(t) = 15\sin\left(314t + \frac{5\pi}{6}\right)$$

(a) What is the impedance of the circuit?

(b) What is the value of the resistance?

(c) What is the inductance in henrys?

(d) What is the average power drawn by the circuit?

(e) What is the power factor?

Q.3. What is a SCR? Sketch V-I characteristics of Thyristor. Label the various voltages current and operating mode on this sketch.

Q.4. Explain Superposition theorem. Use the superposition theorem to find ' I ' in the circuit shown in Fig. 2.

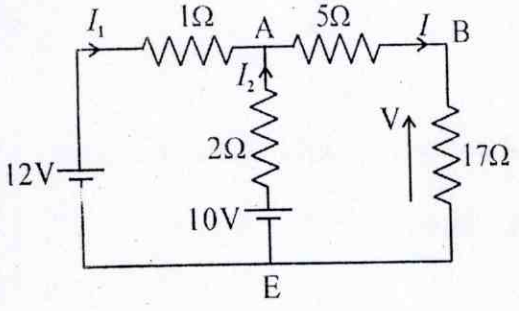

Fig. 2

Q.5. Write short notes on the following :

(i) ELCB

(ii) SFU

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1E3109

Total No. of Questions : 22 Total No. of Pages : 03

Roll No. : .....

1E3109

B.Tech. I-Sem. (Main/Back) Exam. - 2024

1FY3-09 / Basic Civil Engineering

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates :

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly. Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

1. ..... 2. .....

PART-A

(Answer should be given upto **25** words only)

All questions are compulsory

[10x2=20]

Q.1. Discuss scope of Civil Engineering and give two objects of Civil Engineering.

Q.2. What is fore bearing and back bearing of a line?

Q.3. What are the principles of Surveying?

Q.4. Define Air Pollution and its causes.

Q.5. Define Contour.

Q.6. What do you understand by Ozone depletion?

Q.7. What are the different modes of Transportation?

Q.8. Define carpet area and plinth area.

Q.9. What is ranging in Surveying?

Q.10. Name various components of a building.

PART-B

(Analytical / Problem solving questions)

Attempt **any five** questions

[5x4=20]

Q.1. Write the difference between whole circle bearing and reduced bearing.

Q.2. Describe Rain Water Harvesting.

Q.3. What are the safety measures to avoid road accidents?

Q.4. What are the water quality standard parameters?

Q.5. A steel tape 20 meter in length used to measure a distance of 300 meters was found 10 cm long at the end of work, calculate the correct measured distance.

Q.6. What do you understand by solid waste management?

Q.7. What are the different aspects to be considered in site selection of a building?

PART-C

(Descriptive/Analytical/Problem solving/ Design questions)

Attempt **any three** questions

[3x10=30]

Q.1. Elaborate water treatment and disposal of waste water.

Q.2. The following staff readings were observed successively with a level. The instrument has been shifted after the second and fifth reading : 0.675, 1.230, 0.750, 2.565, 2.225, 1.935, 1.835, 3.220. The first reading was with staff held on bench mark of RL 100.000 m. Enter the readings in a page of level book and calculate the RL of all points. Apply arithmetic checks (by rise and fall method).

Q.3. Explain the flow of nitrogen nutrients in environmental cycle with neat sketch.

Q.4. State Building Bye-laws. Explain various types of buildings along with their functions.

Q.5. What are cumulative and compensating errors ? Also, define various types of tape corrections.

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1E2401

Total No. of Questions : 22 Total No. of Pages : 04

Roll No. : .....

1E2401

B.Tech. I-Sem. (Back) Exam. - 2024

BSC

1FY2-01 / Engineering Mathematics-I

Time : 3 Hours

Maximum Marks : 160

Min. Passing Marks : 56

Instructions to Candidates :

Attempt all ten questions from Part A, five questions out of seven questions from Part B and four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory

[10×3=30]

Q.1. Compute $\beta\left(\frac{5}{2},\frac{3}{2}\right)$.

Q.2. Show that $\int_0^{\frac{\pi}{2}} \sqrt{\cot\theta}\, d\theta = \frac{\pi}{\sqrt{2}}$.

Q.3. Test the convergence of $\sum_{n=1}^{\infty} u_n$, where $u_n = \frac{n}{n+1}$.

Q.4. Find the Fourier coefficient a_0 for the function $f(x) = x^2$, $-\pi < x < \pi$.

Q.5. Evaluate $\lim_{\substack{x\to 1 \\ y\to 2}} \frac{2x^2 y}{x^2 + y^2 + 1}$.

Q.6. State Euler's theorem on Homogeneous functions.

Q.7. Find the tangent plane for $f(x, y, z) = x^2 + y^2 + z - 9 = 0$, at (1, 2, 4).

Q.8. Change $\int_0^{\infty}\int_0^{\infty} e^{-(x^2+y^2)}\, dx\, dy$ into polar coordinates.

Q.9. Evaluate grad ϕ, if $\phi = \log(x^2+y^2+z^2)$.

Q.10. State Green's theorem.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions

[5×10=50]

Q.1. Find the volume of the solid generated by revolving the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about the :

(i) x - axis (ii) y - axis

Q.2. State the Hyperharmonic series test (P-series test) and hence show that the series $\sum_{n=1}^{\infty} \frac{1}{n} \sin \frac{1}{n}$ is convergent.

Q.3. Find the half range sine series for the function $f(x) = x(\pi - x)$ for $0 \le x \le \pi$ and hence deduce that $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \ldots\ldots = \frac{\pi^3}{32}$.

Q.4. If $\vec{A} = (x + 2y + az)\hat{i} + (bx - 3y - z)\hat{j} + (4x + cy + 2z)\hat{k}$, find a, b, c so that $\vec{A}$ is irrotational. Also find the scalar potential of $\vec{A}$.

Q.5. Find the mass of the plate in the form of a quadrant of an elliplse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, whose density per unit area is given by $\rho = k \cdot xy$.

Q.6. Show that $\nabla^2 f(r) = f''(r) + \frac{2}{r} f'(r)$, where $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$.

Q.7. If $\frac{x^2}{a^2 + u} + \frac{y^2}{b^2 + u} + \frac{z^2}{c^2 + u} = 1$, prove that $u_x^2 + u_y^2 + u_z^2 = 2(xu_x + yu_y + zu_z)$.

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any four questions

[4×20=80]

Q.1. Show that $\Gamma m \; \Gamma(m + ½) = \frac{\sqrt{\pi}}{2^{2m-1}} \Gamma(2m); m \in z$.

Q.2. Test the convergence of the series : $\frac{1^2}{2^2} + \frac{1^2 \cdot 3^2}{2^2 \cdot 4^2} + \frac{1^2 \cdot 3^2 \cdot 5^2}{2^2 \cdot 4^2 \cdot 6^2} + \ldots\ldots$

Q.3. Obtain the Fourier series for the function : $f(x) = x^2, -\pi < x < \pi$.

Hence, show that :

(i) $\frac{\pi^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \frac{1}{4^2} + ...$

(ii) $\frac{\pi^2}{12} = 1 - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + ...$

(iii) $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + ...$

Q.4. Find the maximum and minimum distances of the point (3, 4, 12) from the sphere $x^2 + y^2 + z^2 = 1$.

Q.5. Apply divergence theorem to compute $\iint_s \vec{F} \cdot \hat{n}\, ds$, where $\vec{F} = xy\hat{i} + z^2\hat{j} + 2yz\hat{k}$ and s is the surface bounded by the tetrahedron $x = y = z = 0, x + y + z = 1$.

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1E2402

Total No. of Questions : 22 Total No. of Pages : 04

Roll No. : .....

1E2402

B.Tech. I-Sem. (Back) Exam. - 2024

BSC

1FY2-02/Engineering Physics

Time : 3 Hours

Maximum Marks : 160

Min. Passing Marks : 56

Instructions to Candidates :

Attempt all ten questions from Part-A, five questions out of seven questions from Part-B and four questions out of five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART-A [10×3=30]

(Answer should be given upto 25 words only)

All questions are compulsory

Q.1. What is Diffraction Grating?

Q.2. What do you understand by resolution?

Q.3. Write a short note on Normalized and Orthogonal condition.

Q.4. Write the basic postulate of wave function.

Q.5. Define spatial coherence.

Q.6. Write the basic principle of optical fiber.

Q.7. Explain the meaning of 'Stimulated Emission'.

Q.8. Explain covalent and metallic bonding.

Q.9. Define Laplace's equation.

Q.10. Define Divergence and curl of electrostatic field.

PART-B [5×10=50]

(Analytical/Problem Solving Questions)

Attempt any five questions

Q.1. Newton's rings are produced with Plano convex lens of radius of curvature of 1m. The diameter of the 10th dark fringes is 4.54 mm as viewed normally, find the wavelength of light used.

Q.2. Consider a particle confined in one dimensional box with 'a'. Find the probability that the particle is found between $x = 0$ and $x = a/n$ when it is in the nth state.

Q.3. A laser operates at wavelength of 6000A and its spectral line width ($\Delta\upsilon$) is 10^2 Hz. For this laser. Calculate :

(a) Coherence langth

(b) Quality factor.

Q.4. The spectral spread of red cadmium light of wavelength 643.8nm is 0.001nm. Calculate coherence length and coherence time.

Q.5. Calculate the Hall coefficient R_H for sodium. Density of sodium is 0.96 g cm^{-3}.

Q.6. State and prove Poynting theorem. Explain the term Poynting vector.

Q.7. If A and B are two irrotational vector fields, then prove that (A×B) will be a solenoidal vector.

PART-C **[4×20=80]**

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any four questions

Q.1. Explain the working of Michelson's interferometer. How circular fringes be produced with it? Show with necessary theory how it be used to measure the difference in the wavelength between D-lines of sodium light.

Q.2. Write down the Schrödinger's equation for a particle enclosed in one dimensional box of size 'a'. Solve it for Eigenvalues and Eigenfunction.

Q.3. What is an optical fiber? What do you mean by numerical aperture of an optical fiber? Find an expression for the numerical aperture of a step index optical fiber.

Q.4. Describe the laser action in Helium Neon laser with energy diagram. Describe various applications of lasers.

4c

Q.5. Describe in brief the formation of energy bands in solids and hence explain how it helps to classify the solids into conductors in insulators.

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1E2407

Total No. of Questions : 14 Total No. of Pages : 04

Roll No. : .....

1E2407

B.Tech. I-Sem. (Back) Exam. - 2024

ESC

1FY3-07 / Basic Mechanical Engineering

Time : 2 Hours

Maximum Marks : 80

Min. Passing Marks : 28

Instructions to Candidates :

Attempt all five questions from Part-A, four questions out of six questions from Part-B and two questions out of three questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in Form No. 205)

1. ..... 2. .....

PART-A **[2x5=10]**

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1. What is the difference between mountings and accessories of a Boiler? Give examples also.

Q.2. What is the function of a Carburettor and fuel injector in an IC engine?

Q.3. Differentiate between a Refrigerator and a heat pump and define 'Coefficient of Performance'.

Q.4. Explain various gas welding flames with the help of neat sketches.

Q.5. Write two advantages of cold working over hot working processes.

PART-B **[4x10=40]**

(Analytical/Problem solving questions)

Attempt any four questions

Q.1. Draw a neat sketch of a Cochran Boiler and explain its working.

Q.2. Draw a schematic of a hydroelectric power plant. Also compare a thermal power plant with a hydroelectric power plant.

Q.3. Explain vapor compression refrigeration cycle with the help of neat schematic and temperature-entropy chart.

Q.4. Discuss construction and working of single stage reciprocating compressor with the help of a neat sketch.

Q.5. Describe various parts of an IC engine and compare petrol engines with diesel engines.

Q.6. Explain hand tools used in foundry shop with the help of neat sketches.

PART-C [15x2=30]

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any two questions

Q.1. (a) Briefly explain :

(i) Relative humidity

(ii) Absolute humidity

(iii) Dry bulb temperature

(iv) Wet bulb temperature

(b) Compare Vapor compression refrigeration system with air refrigeration system.

Q.2. Explain following processes in detail :

(a) Forging

(b) Rolling

(c) Hot and cold extrusion

(d) Brazing

(e) Soldering

(f) Hardening

Q.3. (a) Explain with the help of neat sketches :

(i) Open belt drive

(ii) Cross belt drive

(iii) Fast and loose pulley drive

(iv) Stepped or cone pulley drive

(b) What are the various types of gears used for transmission of power? On what basis a particular gear is selected for the given application? Explain.

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1E2408

Total No. of Questions : 14 Total No. of Pages : 04

Roll No. : .....

1E2408

B.Tech. I-Sem (Back) Exam. - 2024

ESC

1FY3-08 / Basic Electrical Engineering

Time : 2 Hours

Maximum Marks : 80

Min. Passing Marks : 28

Instructions to Candidates :

Attempt all five questions from Part-A, four questions out of six questions from Part-B and two questions out of three questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in Form No. 205)

1. ..... 2. .....

PART-A **[5×2=10]**

(Answer should be given upto 25 words only)

All questions are compulsory

Q.1. State and explain the maximum power transfer theorem.

Q.2. Draw the equivalent circuit diagram for a single phase transformer.

Q.3. Explain the reason that rotor of an induction motor rotates in the same direction as the stator magnetic field and why the speed of the motor is less than the synchronous speed?

Q.4. What is the difference between BJT and SCR?

Q.5. Explain the following terms for DC motor :

(a) Armature reaction

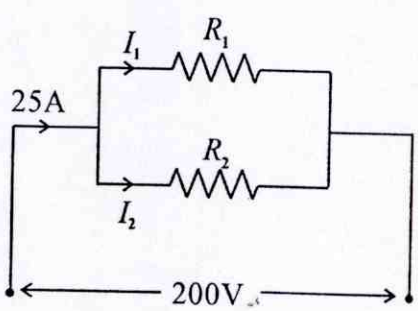
(b) Commutator

PART-B **[4x10=40]**

(Analytical/Problem Solving Questions)

Attempt any four questions.

Q.1. Two coils are connected in parallel and a voltage of 200V is applied to the terminals. The total current taken is 25A and the power dissipated in one of the coils is 1500W. Determine the resistance of each coil.



Q.2. A 4700 Ω resistor and 2μF capacitor are connected in parallel across a 240V, 60Hz source. Determine the circuit impedance and line current.

Q.3. Explain the construction and EMF equation of single phase transformer.

Q.4. An 8 pole lap connected armature has 960 conductors, a flux of 40m Wb per pole and a speed of 400 rpm. Determine the emf generated.

Q.5. Explain the basic circuit, operation and waveforms for single phase rectifier with R load.

Q.6. Explain the different types of Earthing.

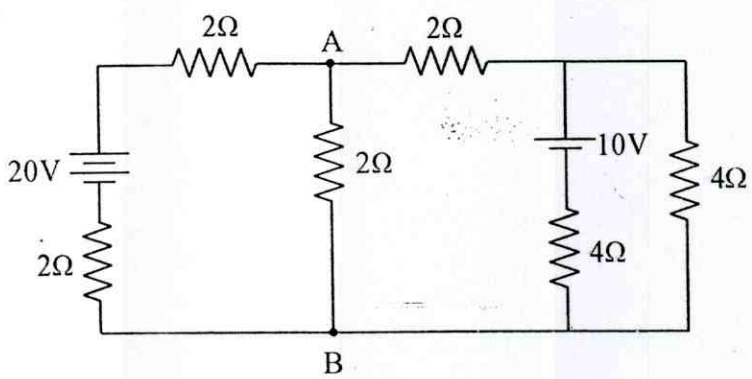
PART-C **[2x15=30]**

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any two questions.

Q.1. Explain the construction, principle of operation, equivalent circuit of three phase induction motor.

Q.2. Determine the current through the branch AB of the network shown here using Thevenin's equivalent.



Q.3. Explain the following in detail :

(a) Voltage and current relations in star and delta connections.

(b) DC-DC converter.

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