BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: MECH/CIVIL/PROD/CHEMICAL/BIOTECH

SEMESTER : II
SESSION : SP/2023

SUBJECT: ME101 BASICS OF MECHANICAL ENGINEERING

TIME: 3 HOURS

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | Determine the forces in BD and BE members with proper free body diagram of the whole truss as shown in Figure 1 | [5] | 1 | M |

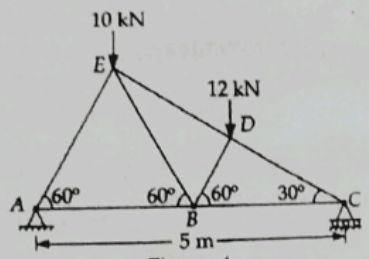

Figure 1

| | | | | |
|---|---|---|---|---|
| Q.1(b) | A steel rod 5 m long and 30 mm in diameter is subjected to an axial tensile load of 50 KN. Determine the change in length, diameter and volume of the rod. Take E = 2 x$10^5$ N/$mm^2$ and Poisson's ratio = 0.25 | [5] | 1 | H |
| Q.2(a) | A bar of length 2 m has its end A and B constrained to move horizontally and vertically. The end A of bar is inclined $30^0$ with the horizontal and moves with a constant velocity of 6 m/s horizontally. Make calculations for: (i) the angular velocity of the bar AB, (ii) the velocity of the end B, and (iii) the velocity of the midpoint of the bar at the instant when the bar makes an angle of $30^0$ with the horizontal. | [5] | 2 | M |
| Q.2(b) | In a crank and connecting rod mechanism, the crank is 300 mm long and the connecting rod 1500 mm long. If the crank rotates uniformly at 300 rpm, find the velocity of the cross-head when the crank is inclined at $30^0$ with the inner dead Centre. | [5] | 2 | H |
| Q.3(a) | For a simple screw jack, derive the expressions for effort applied at the circumference of spindle and force applied at the end of the lever, when the load is hoisted upwards. | [5] | 3 | L |
| Q.3(b) | Two blocks of weight 200 N and 300 N and connected by a string passing over a frictionless pulley rest on rough surfaces; block of weight 200 N on horizontal surface and the other on an inclined surface as shown in Figure 2. For both the surfaces the coefficients of friction μ = 0.25. Find out the minimum value of force, both in magnitude and direction, for the motion to impend. | [5] | 3 | M |

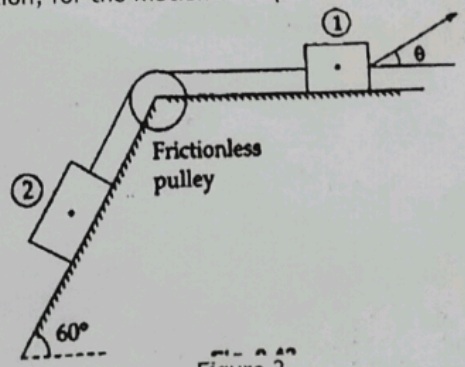

Figure 2

PTO

| | | | | | |
|---|---|---|---|---|---|
| Q.4(a) | Differentiate between two stroke and four stroke engine. | [5] | 4 | L |
| Q.4(b) | A furnace wall comprises three layers: 13.5 cm thick inside layer of fire brick, 7.5 cm thick middle layer of insulating brick and 11.5 cm thick outside layer of red brick. The furnace operates at 870°C and it is anticipated that the outside of this composite wall can be maintained at 40°C by the circulation of air. Assuming close bonding of layers at their interfaces, find the rate of heat loss from the furnace and the wall interface temperature. The wall measures 5m x 2m and the data on thermal conductivities is : Fire brick $k_1$ = 1.2 W/m-deg, Insulating brick $k_2$ = 0.14 W/m-deg, and red brick $k_3$ = 0.85 W/m-deg. | [5] | 4 | M |
| Q.5(a) | Explain advantages and disadvantages of renewable and nonrenewable energy resources. | [5] | 5 | L |
| Q.5(b) | Explain when and where tides occur? How tidal energy is harnessed for useful power utilization. Explain your answer with suitable diagrams. | [5] | 5 | L |

:::::21/07/2023:::::

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: BIOTECH/CIVIL/CHEMICAL/MECH/PIE

SEMESTER: II
SESSION: SP/2023

SUBJECT: EC101 BASICS OF ELECTRONICS AND COMMUNICATION ENGINEERING

TIME: 3 HOURS

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data handbook/Graph paper etc. to be supplied to the candidates in the examination hall.

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| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | Explain the breakdown mechanism in a P-N junction diode. Also illustrate the types of capacitances and their reason of occurrence in a P-N junction diode. | [5] | 1 | 2 |
| Q.1(b) | A full-wave rectifier uses two diodes, the internal resistance of each diode may be assumed constant at 20 Ω. The transformer r.m.s. secondary voltage from centre tap to each end of secondary is 50 V and load resistance is 980 Ω. Find: (i) the mean load current (ii) the r.m.s. value of load current. | [5] | 1 | 5 |
| Q.2(a) | What do you mean by inversion of channel in MOSFET? Explain channel formation in JFET with neat diagram. | [5] | 2 | 2 |
| Q.2(b) | A transistor used in CE arrangement has the following set of h parameters when the d.c. operating point is $V_{CE}$ = 10 volts and $I_C$ = 1 mA : hie = 2000 Ω; hoe = $10^{-4}$ mho; hre = $10^{-3}$; hfe = 50. Determine (i) input impedance (ii) current gain and (iii) voltage gain. The a.c. load seen by the transistor is $R_L$ = 600 Ω. Assume approximate values up to the reasonable approximations. | [5] | 2 | 5 |
| Q.3(a) | Explain any operational amplifier circuit as an application of negative feedback. Draw the circuit of differentiator using op-amp and derive the expression for its output voltage. | [5] | 3 | 1&2 |
| Q.3(b) | Draw the circuit diagram of a Colpitt's Oscillator explaining Barkhausen's criteria for sustained oscillations. Determine the (i) operating frequency and (ii) feedback fraction for Colpitt's oscillator which has two capacitors of values 1 nF and 10 nF connected in parallel with an inductor of value 15 μH. | [5] | 3 | 1&3 |
| Q.4(a) | State and prove any two theorems of Boolean algebra with its duals. | [5] | 4 | 1&3 |
| Q.4(b) | Draw 4-bit parallel adder/subtractor circuit and explain its working using truth table & suitable logic expressions. | [5] | 4 | 2 |
| Q.5(a) | Draw the block diagram showing elements of communication system. What is the need of modulation in communication system? | [5] | 5 | 1&2 |
| Q.5(b) | Define Frequency modulation. Derive the frequency modulated wave expression using a single-tone sinusoidal message signal. Also, draw its time-domain representation. | [5] | 5 | 2 |

:::::20/07/2023:::::

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH / BHMCT / IMSC
BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE/HMCT/ICH/QEDS/IMH/IPH

SEMESTER : 2nd
SESSION : SP/2023

SUBJECT: CE101 ENVIRONMENTAL SCIENCE

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | Draw and explain different types of ecological pyramids. | [5] | 1 | 2 |
| Q.1(b) | Differentiate between grassland and detritus food chains with example. | [5] | 1 | 4 |
| Q.2(a) | Explain the effects of particulate matter and gaseous pollutants. | [5] | 2 | 2 |
| Q.2(b) | Discuss the working principle of scrubbers and cyclones. | [5] | 2 | 2 |
| Q.3(a) | Explain the chlorination process for water treatment in details. | [5] | 3 | 2 |
| Q.3(b) | Classify different types of secondary water treatment. | [5] | 3 | 2 |
| Q.4(a) | Discuss soil pollution in brief. | [5] | 4 | 2 |
| Q.4(b) | Explain the collection and transport functional elements for municipal solid waste management. | [5] | 4 | 2 |
| Q.5(a) | Explain noise pollution control measures in brief. | [5] | 5 | 2 |
| Q.5(b) | Discuss the sources and effects of radioactive pollution. | [5] | 5 | 2 |

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BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: ALL

SEMESTER : II
SESSION : SP/2023

SUBJECT: MA107 MATHEMATICS-II

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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| | | | | CO | BL |
|---|---|---|---|---|---|
| Q.1(a) | Solve the differential equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = e^x + x + 1$ | [5] | 1 | 1,2 |
| Q.1(b) | Solve Legendre's linear equation given as $(x+a)^2\frac{d^2y}{dx^2} - 4(x+a)\frac{dy}{dx}$+6y=x | [5] | 1 | 1,2 |
| Q.2(a) | Prove that $\int J_3(x)\,dx + J_2(x) + \frac{2}{x}J_1(x) = 0$ | [5] | 2 | 1,2,3 |
| Q.2(b) | Express in terms of Legendre polynomials: $x^3 + 2x^2 - x - 3$. | [5] | 2 | 1,2,3 |
| Q.3(a) | Obtain the half range sine series for f(x)=2-x for 0<x<2 and hence deduce that $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \ldots = \frac{\pi}{4}$. | [5] | 3 | 1,2,3 |
| Q.3(b) | Solve the wave equation $\frac{\partial^2 y}{\partial t^2} = c^2\frac{\partial^2 y}{\partial x^2}$, representing the vibration of a string of length l, fixed at both ends, given that y(0,t)=0, y(l,t)=0, y(x,0)=f(x) and $\left(\frac{\partial u}{\partial t}\right)_{t=0} = 0$, 0<x<l. | [5] | 3 | 1,2,3 |
| Q.4(a) | Prove that $u=y^3-3x^2y$ is a harmonic function. Find its harmonic conjugate and corresponding analytic function f(z)=u+iv. | [5] | 4 | 1,2,3 |
| Q.4(b) | Evaluate $\int_C \frac{5z-2}{z^2-z}\,dz$ where C: \|z\|=2 | [5] | 4 | 1,2,3 |
| Q.5(a) | A random variable X has the following probability distribution: | [5] | 5 | 1,2,3 |

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| P(x) | k | 2k | 2k | $k^2$ | $5k^2$ |

Find the value of k, mean and variance of X.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Q.5(b) | The distribution of the number of road accidents per day in a city is Poisson with mean 4. Find the number of days out of 100 when there will be (i) no accidents (ii) between 2 and 5 accidents. | [5] | 5 | 1,2,3 |

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BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTech
BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE

SEMESTER : II
SESSION : SP/2023

SUBJECT: CH101 CHEMISTRY

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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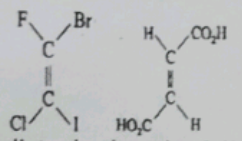
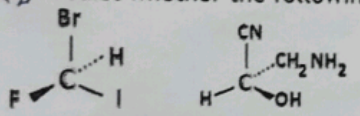
| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | Draw Born-Haber cycle for the formation of KCl. What are the applications of Born-Haber cycle? | [3+2] | 1 | 2 |
| Q.1(b) | (i) For $[CoCl_6]^{3-}$, Predict whether this compound is high or low spin. Briefly explain your answer.<br>(ii) Why do $d^3$ complexes not show Jahn-Teller distortions? | [3+2] | 1 | 3 |
| Q.2(a) | Draw the molecular energy level diagram for Carbon monoxide (CO) and predict the bond order of CO. | [5] | 2 | 2 |
| Q.2(b) | (i) Predict whether the following compounds are E or Z isomer? | [2+3] | 2 | 3 |



(ii) Predict whether the following compounds are R or S isomer?



| | | | | |
|---|---|---|---|---|
| Q.3(a) | Discuss the collision theory of bimolecular reactions. What are the limitations of collision theory? | [3+2] | 3 | 2 |
| Q.3(b) | What is the Michaelis-Menten kinetic scheme and equation? How Michaelis-Menten constant ($K_m$) can be determined? | [3+2] | 3 | 2 |
| Q.4(a) | What is Lambert-Beer's law? What are the limitations of Lambert-Beer's law? | [3+2] | 4 | 2 |
| Q.4(b) | What do you mean by the term 'chemical shrift' in NMR spectrum? Discuss the proton NMR signals for the $CH_3CH_2CH_2$ Br. | [2+3] | 4 | 3 |
| Q.5(a) | What is phase rule? Calculate the number of degrees of freedom in the following systems:<br>(i) $2KClO_3(s) \rightarrow 2KCl(s) + 3O_2(g)$<br>(ii) An aqueous solution of sodium chloride | [3+2] | 5 | 3 |
| Q.5(b) | Draw a neat phase diagram of water system, Discuss the behavior of various equilibrium involved in the system with varying pressure and temperature. | [5] | 5 | 2 |

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BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH/IMSC
BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE/FT

SEMESTER : 1st
SESSION : MO/2022

SUBJECT: CS101 PROGRAMMING FOR PROBLEM SOLVING

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
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| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | Describe any four basic data types in C. | [5] | CO1 | 2 |
| Q.1(b) | Explain typecasting with an example. | [5] | CO1 | 2 |
| Q.2(a) | Write a program in C to take an integer number as user input and check if it is a palindrome or not. | [5] | CO2,3 | 2 |
| Q.2(b) | Write a program to print the following pattern:<br>1<br>12<br>123<br>1234<br>12345 | [5] | CO2,3 | 2 |
| Q.3(a) | Write a program in C to implement binary search algorithm. | [5] | CO2,3 | 2 |
| Q.3(b) | Compute the output of the following C program using arrays: | [5] | CO2,3 | 3 |

```
#include <stdio.h>
int main ()
{
  int A [10]= {0, 1, 2, 3, 4, 5, 6, 7, 8, 9};
  int i, j, B[5];
  for (i=0, j=0; i<5; i++, j=j+2)
  {
  B[i]= A[j];
  }
  for (i=0; i<5; i++)
  {
 printf("%d \n", B[i]);
  }
return 0;
}
```

| | | | | |
|---|---|---|---|---|
| Q.4(a) | Define a recursive function with an example. | [5] | CO3,4 | 1 |
| Q.4(b) | Explain the difference between passing arguments to a function by reference and by value with appropriate examples. | [5] | CO3,4 | 2 |
| Q.5(a) | Differentiate between a structure and an array. | [5] | CO4,5 | 2 |
| Q.5(b) | Write a program in C to find the largest of three integer numbers using pointers. | [5] | CO4,5 | 3 |

::::::16/03/2023::::::M

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH/IMSC
BRANCH: BT/CHEMICAL/CIVIL/MECH/PIE/IPH

SEMESTER : I
SESSION : MO/2022

TIME: 3 Hours

SUBJECT: EE101 BASICS OF ELECTRICAL ENGINEERING

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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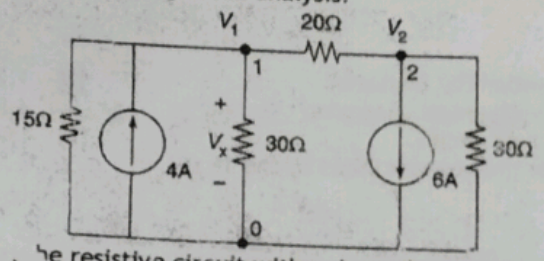
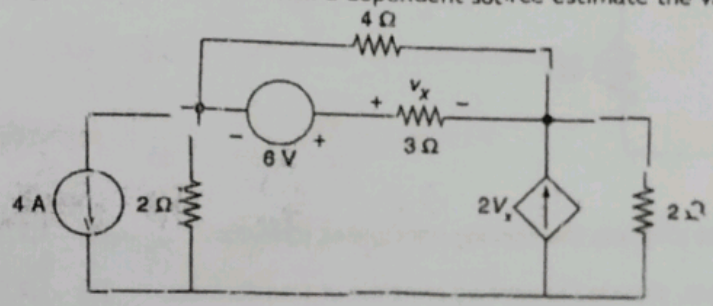
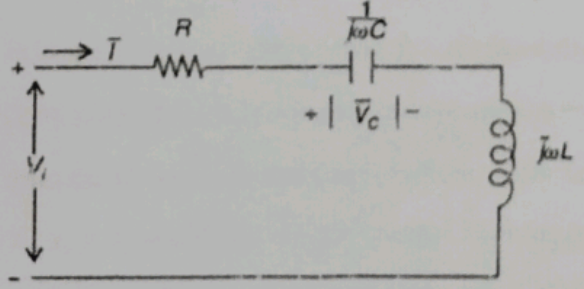
| | | | | CO | BL |
|---|---|---|---|---|---|
| Q.1(a) | Predict $V_x$ using nodal analysis. | | [5] | 1,2 | 3 |




| | | | | | |
|---|---|---|---|---|---|
| Q.1(b) | In the resistive circuit with a dependent source estimate the value of $V_x$. | | [5] | 1,2 | 3 |




| | | | | | |
|---|---|---|---|---|---|
| Q.2(a) | Explain the phenomenon of resonance in series RLC circuit with the help of mathematical expressions and appropriate phasor diagram. | | [5] | 1,2, 5 | 3 |
| Q.2(b) | A capacitor of 12 nF is connected in series with an inductor of 4 mH and 5 Ω resistance. (a) Calculate the resonant frequency, $\omega_0$ (b) At $\omega_0$ the voltage across the capacitor is required to be 1.5V. Propose the voltage which should be applied across the circuit input. (c) Draw a phasor diagram. | | [5] | 1,2, 5 | 5 |




| | | | | | |
|---|---|---|---|---|---|
| Q.3(a) | A balanced 3-phase star-connected load of 120 kW takes a leading current of 100A when connected across a 3-phase, 3.3 kV, 50 Hz supply. Determine the impedance, resistance, capacitance, and power factor of the load. | | [5] | 2,3, 5 | 4 |

PTO

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH/IMSC
BRANCH: ALL/FT

SEMESTER : I
SESSION : MO/2022

SUBJECT: MA103 MATHEMATICS - I

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
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| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | Test the convergence of the series: $\frac{x}{1.2}+\frac{x^2}{3.4}+\frac{x^3}{5.6}+\ldots\ldots, \; x>0.$ | [5] | 1 | 4 |
| Q.1(b) | Test for absolute and conditional convergence of the series: $\sum_{n=1}^{\infty}\frac{(-1)^{n-1}}{n^p}, p>0$ | [5] | 1 | 4 |
| Q.2(a) | Find the eigen values and corresponding eigen vectors of the following matrix: $\begin{pmatrix} 3 & 1 & -1 \\ -2 & 1 & 2 \\ 0 & 1 & 2 \end{pmatrix}$ | [5] | 2 | 3 |
| Q.2(b) | Using Cayley Hamilton theorem find the inverse of the matrix $A=\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ and express $A^6-4A^5+8A^4-12A^3+14A^2$ as a linear polynomial of $A$. | [5] | 2 | 4 |
| Q.3(a) | Show that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial x}+z\frac{\partial u}{\partial z}+3\tan u=0$ when $u=\sin^{-1}\left(\frac{x+2y+z}{\sqrt{x^8+y^8+z^8}}\right)$ | [5] | 3 | 2 |
| Q.3(b) | Discuss the maximum and minimum of the function: $f(x,y)=x^3+3xy^2-15x^2-15y^2+72x$ | [5] | 3 | 2 |
| Q.4(a) | Evaluate $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{2xy}(x^2+y^2)\,dzdydx$ by changing coordinate system. | [5] | 4 | 4 |
| Q.4(b) | Evaluate $\iint_R (x+y)^2\,dxdy$, where R is the parallelogram in the xy-plane with vertices (1,0), (3,1), (2,2), (0,1) using the transformation u = x + y and v = x- 2y. | [5] | 4 | 4 |
| Q.5(a) | Find the Divergence and Curl of of the vector function $\vec{F}(x,y,z)=e^{xyz}(xy^2\,\hat{i}+yz^2\,\hat{j}+zx^2\,\hat{k})$ at the point (1, 2, 3). | [5] | 5 | 3 |
| Q.5(b) | Applying Green's theorem, evaluate $\oint_C (x^5+3y)\,dx+(2x-e^{y^3})dy$, where C is the circle $(x-1)^2+(y-5)^2=4$. | [5] | 5 | 4 |

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BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: BTECH
BRANCH: BT/CHEMICAL/CIVIL/MECH/PROD

SEMESTER : I
SESSION : MO/2022

SUBJECT: PH113 PHYSICS

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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| | | | CO | BL |
|---|---|---|---|---|
| Q.1(a) | Develop the intensity distribution formula due to single slit Fraunhofer diffraction. | [5] | 1 | 3 |
| Q.1(b) | A parallel beam of light ($\lambda$ = 5890Å) strikes a film of oil ($\mu$ = 1.46). If the 8th dark ring be seen, when viewed at an angle of 30° to the normal, find the thickness of the film. | [5] | 1 | 1 |
| Q.2(a) | Develop boundary conditions for $\vec{E}$ and $\vec{D}$ separated by two dielectric media of different permittivity. | [5] | 2 | 6 |
| Q.2(b) | Summarize Maxwell's four equations in integral and differential form. | [5] | 2 | 2 |
| Q.3(a) | Prove that the relation $x^2 + y^2 + z^2 - c^2t^2 = 0$ is invariant under Lorentz transformation. | [5] | 3 | 5 |
| Q.3(b) | Find the mass and speed of 2MeV electron (use relativistic mechanics). | [5] | 3 | 1 |
| Q.4(a) | Explain Davisson-Germer experiment. What inference one should get from this experiment? | [5] | 4 | 5 |
| Q.4(b) | What is de-Broglie hypothesis? Find the speed of a particle whose de-Broglie wavelength and Compton wavelength are equal. | [5] | 4 | 1 |
| Q.5(a) | Explain some of the important characteristics of laser. | [5] | 5 | 2 |
| Q.5(b) | Find nuclear binding energy per nucleon of $^{16}_{8}O$. Given $M_p = 1.007276\ a.m.u$, $M_n = 1.008664\ a.m.u$ . | [5] | 5 | 1 |

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BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: B.TECH/HMCT
BRANCH: BT/CHEM/CIVIL/PROD/MECH/HMCT

SEMESTER: 1st
SESSION:MO/2022

SUBJECT: BE101/BER101 BIOLOGICAL SCIENCE FOR ENGINEERS

TIME: 3 Hours

FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

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| Q.1(a) | Describe Miller's experiment with suitable diagram. | [5] | 1 | 1 |
| Q.1(b) | Explain different level of biological organization. | [5] | 1 | 1 |
| Q.2(a) | Illustrate the process of photosynthesis. | [5] | 2 | 1 |
| Q.2(b) | Summarize the different steps and outcomes of Krebs's cycle. | [5] | 2 | 2 |
| Q.3(a) | Draw and differentiate the two models of enzyme-substrate complex formation. | [5] | 3 | 2 |
| Q.3(b) | What do you understand by enzyme immobilization? Give a brief note on any two techniques of enzyme immobilization. | [5] | 1 | 3 |
| Q.4(a) | Write a note on any two factors that are known to affect the activity of enzymes. | [5] | 2 | 1 |
| Q.4(b) | Discuss the different types of cell signalling. | [5] | 4 | 2 |
| Q.5(a) | What is central dogma of molecular biology? Why it is important to understand? | [5] | 2 | 2 |
| Q.5(b) | Write any five applications of PCR. | [5] | 1 | 2 |

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