Name __Himanshu__   Enrollment No. __21103262__

Jaypee Institute of Information Technology, Noida
End Term Examination, Odd Semester 2022
B. Tech. II Year III Semester

Course Name: Electrical Science-II   Maximum Time: 2Hrs
Course Code: 15B11EC211   Maximum Marks: 35

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After pursuing this course, the students will be able to:

CO1 Study and analyze the complete response of the first order and second order circuits with energy storage and/or non storage elements.
CO2 Understand two port network parameters and study operational amplifier, first order and second order filters.
CO3 Study the properties of different types of semiconductors, pn junction diode, zener diode and analyze diode applications.
CO4 Study the characteristics, operation of bipolar junction transistors (BJT) and its biasing, stability aspects.

Note: Attempt all the questions.

Q.1 [CO1] (a) In the circuit shown in Fig.1, initial charge of the capacitor is 10C (Q_o=10 C). Find the current flowing in the circuit at t=1 sec.   [2]

Fig. 1
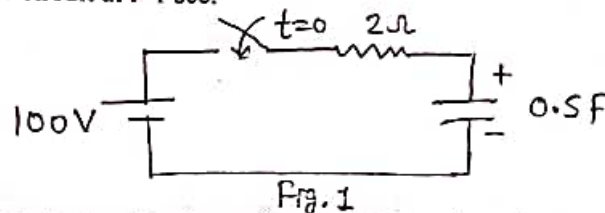
(b) Find the voltage across the inductor and current flowing into the capacitor at $t=0^+$ for the circuit shown in Fig. 2. The initial values of inductor current and capacitor voltage are indicated in the circuit.   [2]
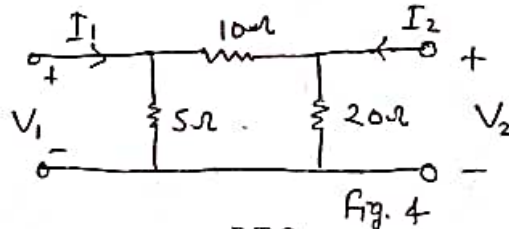

Fig. 2
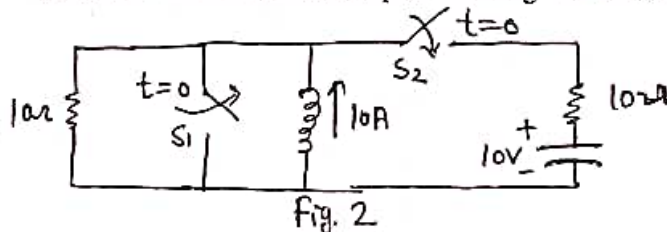
Q.2 [CO2] (a) For the circuit shown in Fig. 3, find the output voltage (V_{out}). Consider the Op-amp to be ideal.   [2]
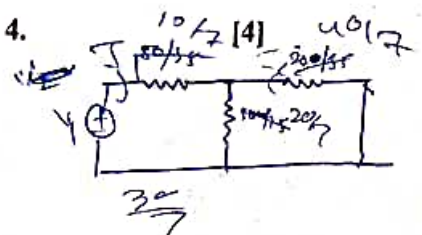

Fig. 3
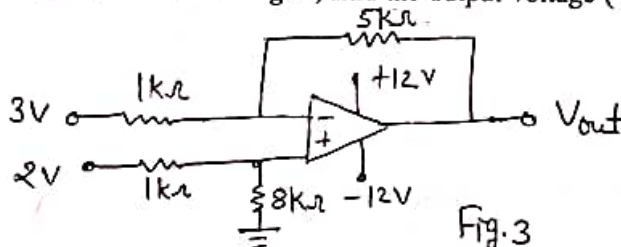
(b) Draw the circuit diagram of an integrator circuit using Op-amp. Also, derive the expression for output voltage in terms of input voltage.   [2]
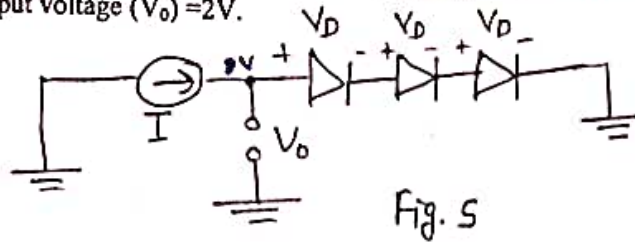
Q.3 [CO2] Find the transmission (ABCD) parameters for the network shown in Fig. 4.   [4]


Fig. 4

P.T.O.

Q.4. [CO3] (a) In the circuit shown in **Fig. 5**, all the diodes are identical. The reverse saturation current (I_s) and ideality factor (η) are given as 10^{-14} A and 1, respectively. Find the values of current (I) and voltage (V_D) to obtain output voltage (V_0) =2V. [2]


Fig. 5

(b) The primary winding of the step-down transformer of a bridge rectifier is connected to AC mains (220 V, 50 Hz). It uses Silicon diodes with V_T=0.7 V. If it is desired to obtain maximum DC voltage of 17 V from this circuit, find the turns ratio of the transformer. Also, calculate the PIV rating of the diode. [3]

Q.5 [CO3] (a) A Zener diode has breakdown voltage (V_z=12V) and maximum power rating (P_{zm})=40 mW. Determine the value of V_L, V_R, I_z and P_z for the network shown in **Fig. 6**, if R_L=4 kΩ. [3]

Fig. 6
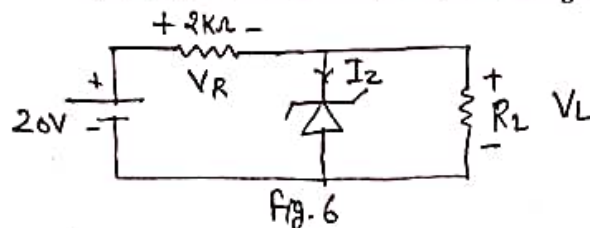
(b) For the given input signal, sketch V_0 for the network shown in **Fig.7**. [2]

Fig.7
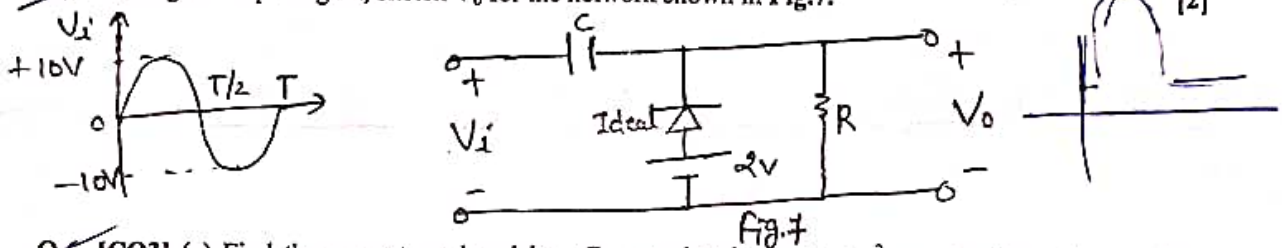
Q.6. [CO3] (a) Find the current produced in a Ge sample of area= 1 cm^2 and length= 0.3 mm when a potential difference of 2V is applied across it. Assume, n_i =2x10^{19} m^{-3}, μ_n=0.35 m^2/V-sec and, μ_p=0.17 m^2/V-sec. [2]

(b) The hall coefficient (R_H) of a semiconductor is 3 x10^{-4} m^{3}c^{-1}. Its resistivity is 8.50 x10^{-3} Ω-m. Calculate the mobility and carrier concentration of the carriers. Also identify the type of material (n-type or p-type). [3]

Q.7. [CO4] (a) For an npn BJT transistor connected in a circuit, base current (I_B) =15μA, emitter current (I_E)=1.5mA. Neglect leakage current in the circuit. Calculate α and β. [2]

(b) Define base width modulation in BJT. [1]

(c) Draw the input and output characteristics of an npn BJT in common base configuration. [2]

Q.8. [CO4] Determine the DC bias voltage (V_{CE}) and current (I_C) for the circuit shown in **Fig. 8**. Also, find the potential at terminal (V_{CB}) [3]

Fig-8
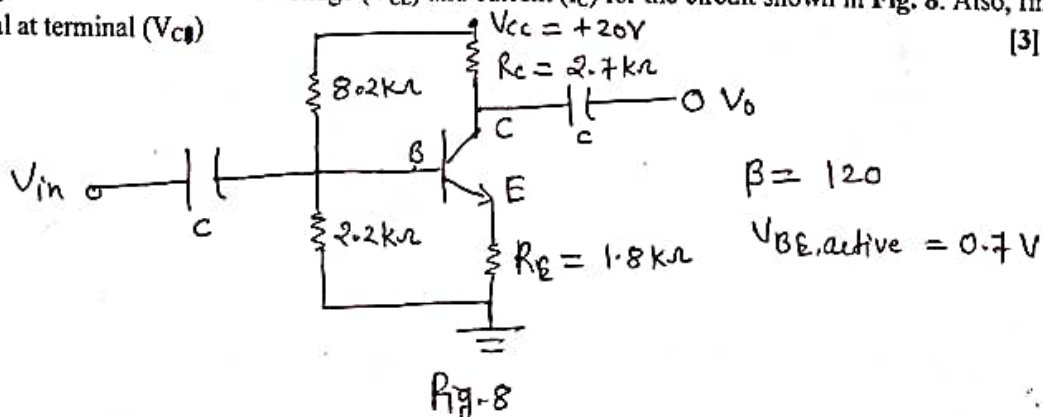
Name _____   Enrollment No.____ _____

Jaypee Institute of Information Technology, Noida
T1 Examination, Even 2022
B.Tech II Semester

Course Title: Mathematics-2

Course Code: 15B11MA211

Maximum Time: 1 Hr

Maximum Marks: 20

After pursuing the course the students will be able to:

CO1: Apply different methods for solving ordinary differential equations of second order.

CO2: Explain different tests/methods of convergence for infinite series.

CO3: Find the series solution of differential equation and use it to construct Legendre's polynomials and Bessel's functions.

CO4: Classify the partial differential equations and apply Fourier series to find their solution.

CO5: Explain Taylor's & Laurent's series expansion, singularities, residues and transformations.

CO6: Apply the concept of complex variables to solve the problems of complex differentiation and integrations.

1. Obtain the general solution of the differential equation: [CO1, 2M]

$$y''-2y'+2y = e^x \cos x$$

2. Solve the following differential equation by removal of first order derivative: [CO1, 3M]

$$y''-4xy'+(4x^2 -1)y = -3e^{x^2} \sin 2x$$

3. Solve the given differential equation by changing the independent variable: [CO1, 3M]

$$(\sin x)y''-(\cos x)y'-(2\sin^3 x)y = 2\sin^3 x$$

4. Solve by method of variation of parameters: [CO1, 3M]

$$y''-2y'+y = e^{-x} \log x$$

5. Test the convergence of infinite series: [CO2, 1M]

$$\sum_{n=1}^{\infty}\left(\frac{1}{n}\sin\left(\frac{1}{n}\right)\right)^n$$

6. Discuss the convergence of the series: [CO2, 4M]

$$1+\frac{2^2 x}{2!}+\frac{3 x^2}{3!}+\frac{4^4 x^3}{4!}+...$$

7. Test the following series for conditional convergence: [CO2, 2M]

$$\sum \frac{(-1)^{n-1} n}{n^2 +1}$$

8. Find the radius and interval of convergence of the power series: [CO2, 2M]

$$1+x+\frac{x^2}{2}+\frac{x^3}{3}+...$$

Jaypee Institute of Information Technology, Noida
END TERM Examination, 2022
B. Tech. ODD Semester

Course Title : Data Structures   Maximum Time : 2 Hrs.
Course Code : 15B11CI311   Maximum Marks : 35

C210.1 Explain abstract data types, memory allocation schemes and need of linear and non-linear data structures
C210.2 Apply and implement various linear data structures, like array, linked list, stack, and queue in different problems and applications
C210.3 Analyze the performance of various sorting and searching techniques
C210.4 Demonstrate and implement various operations like search, traverse, insertion, deletion, etc. on different non-linear data structures
C210.5 Apply appropriate data structure to design an efficient solution for given and identified problem

Q1. [C210.2 Marks 3] Consider the queues Q_1 containing four elements and Q_2 containing none. The only operations allowed on these two queues are Enqueue (Q, element) and Dequeue (Q). What is the minimum number of Enqueue operations on Q_1 required to place the elements of Q_1 in Q_2 in reverse order without using any additional storage?

Q2. [C210.3 Marks 5] Suppose there is an array that contains many duplicates elements in the range of 5 to 9. Write a function for partition of modified quick sort that partition the array into three parts such that left sub-part contains the elements smaller than pivot, middle part contains element equal to the pivot and right sub part contains elements greater than pivot. Also write a recursive function for modified quick sort.
Example: A= {5, 9, 7, 6, 5, 8, 7, 8, 5, 8, 9, 6, 9, 7}. After applying the partition algorithm in the first pass content of the array will be: (5, 6, 5, 6, 5) (7, 7, 7) (8, 9, 8, 9, 8, 9)

Q3. [C210.4 Marks 4] Derive the expression to find the number of leaf nodes in a full k-ary tree of height **m**.

Q4. [C210.3 Marks 5] Given K sorted arrays, suggest the procedure using min heap to merge them in a single sorted array.

Q5. [C210.4 Marks 7] In a binomial heap perform following operations and after each operation, draw the resulting structure of the binomial heap -
insert(127), insert(117), insert(119), insert(120), insert(124), insert(112), insert(111), insert(110), insert(114), insert(118), deleteMin, decreaseKey (119, 17), delete (117).

Q6. [C210.4 Marks 6] Assume we have two graphs G1 = (V1;E1) and G2 = (V2;E2). Also assume that we have a M1 tree which is a MST of G1 and a M2 tree which is MST of G2. Now consider a new graph G = (V; E) such that V = V1 U V2 and E = E1 U E2 U E3 where E3 is a new set of edges strictly between V1 and V2 (V1; V2) that is edges in E3 connect G1 and G2. Now assume we want to find a MST of the new graph G using following algorithm

Algorithm: MST(M1; M2; E3)
(a) e_{min} = a minimum weight edge in E3
(b) M = M1 U M2 U {e_{min}}
(c) return M

Will this algorithm always correctly find MST for G with the given conditions? If yes/no justify using appropriate test case.

Q7. [C210.5 Marks 5] Given a dictionary of strings containing only digits D[ ] : 1, 34, 22, 6, 89, 0, 12, 124, 122, Identify the best suitable data structure which can find whether all possible prefixes of digits of the given string are the part of the dictionary or not. Demonstrate the prefix search for the following examples:
Input 1: 122   Output 1: True (Reason: 1, 12,122 are part of the dictionary)
Input 2: 123   Output 2: False (Reason: 1, 12 are in the dictionary but 123 are not present)

POSSESION OF MOBILES IN EXAM IS UFM PRACTICE.

Name _Himanshu_   Enrollment No. _2110326 2_

Jaypee Institute of Information Technology, Noida

End Semester Examination, 2022
B.Tech 3rd Semester

Course Title: Database Systems and Web   Maximum Time : 2Hrs
Course Code: 15B11CI312   Maximum Marks : 35

C212.1	Explain the basic concepts of Database systems and web components.
C212.2	Model the real world systems using ER diagrams and convert the ER model into relational logical schema.
C212.3	Develop web application with client and server side scripting using Javascript, PHP and connect to database.
C212.4	Make use of SQL commands and relational algebra for query processing.
C212.5	simplify database using normalization process based on indentified keys and functional dependencies.
C212.6	Solve the atomicity, consistency, isolation, durability, transaction, and concurrency related issues of database.

Q1.[C212.6] (a) Insert lock and unlock requests in the schedule S and check if it is possible under 2PL protocol. S = r1(x), r2(z), r3(x), r1(z), r2(y), r3(y), w1(x), w2(z), w3(y), w2(y).

(b) For the schedule give below, which transactions will wait under wait-die deadlock avoidance strategy? The arrival order of the transactions is T1, T2, T3, and T4. S is for shared lock and X is for exclusive lock.

T1	S(A)						X(C)
T2		X(A)		X(B)			
T3					X(B)		
T4			S(B)			S(C)	

(c) Which transactions will wait under wait-wound deadlock avoidance strategy for schedule of 1(b). The arrival order of the transactions is T1, T2, T3, and T4.

(d) Draw wait-for graph for schedule of 1(b) and check whether transactions are in deadlock state.

(2+2+2+2) Marks

Q2.[C212.6] (a) Consider the following schedule S of transactions T1, T2, T3, and T4.
T2:R(Y); T2: R(X); T3: R(X); T3:COMMIT; T1:W(X); T2: W(Y); T2: R(Z); T2:COMMIT; T4:R(X); T4:R(Y); T1: W(Z); T1:COMMIT; T4:COMMIT;
Check the following:
(i) S is conflict serializable or not.
(ii) S is recoverable or not, justify your answer.
(iii) S is cascadeless or not, justify your answer.

(b) Consider following log record created during immediate database modification for log-based recovery.

1. <T1 START>
2. <T1 A 300 500>
3. <T1 COMMIT>
4. <T3 START>
5. <T3 B 560 570>
6. <T4 START>
7. <T4 C 400 300>

8. <CHECKPOINT>
9. <T3 COMMIT>
10. <T2 START>
11. <T2 D 200 250>
12. <T5 START>
13. <T2 COMMIT>
14. <T5 E 500 600>

The system fails at timestamp 14. Find out transactions for which redo and undo operations have to be performed for recovery.   (5+2)Marks

Q3.[C212.5] **(a)** Consider a relation R(A, B, C, D, E) with following functional dependencies: F = {A->C, B->C, C->D, DE->C, CE->A}. Check whether the following decomposition is lossy or lossless: R1(A,D); R2(A,B);R3(B,E);R4(C,D,E); R5(A,E).

(b) Consider two sets of functional dependencies F and G for relation R (A, B, C, D, E, F). F = {A->BC, B->CDE, AE->F} G= {A->BCF, B->DE, E->AB}. Check whether F and G are equivalent or not?   (3+3)Marks

Q4.[C212.4] Translate the following SQL queries into relational algebra for the given relations.

Course (DeptID, Crscode, CrsName, semester)
Teaching (ProfID, Crscode, semester)

(a) select C.CrsName from Course C where C.DeptID = 'CSE'
(b) select C.CrsName from Course C, Teaching T where C.Crscode = T.Crscode and T.semester ='Third'
(c) select T1.ProfID from Teaching T1, Teaching T2 where T1.ProfID=T2.ProfID AND T1.semester= t2.semester AND T1.Crscode<>T2.Crscode   (5 Marks)

Q5.[C212.4] Consider the given relations.

Account (*AccountID, Balance*)
Action (*AccountID, operation_type, new_balance, status*)

Where *operation_type* can have D and U for delete and update operation. Based on the *operation_type* given in Action relation perform the update or delete in Account relation. Also update the *status* in Action relation as per the action taken; such as 'UPDATE: Success', 'DELETE: Success', 'DELETE: ID not found'.   (5 Marks)

Q6.[C212.2] MCD election 2022 held at many states. States were Delhi, Gujarat, and Himachal Pradesh. Around six parties have participated in the election. Every party have contested from many locations in each state. Parties have party office where its member meets during election, all party members reside in party office where each member has single cabin.
Design an ER/EER diagram for the given problem. Identify the constraints like Total participation, Weak and Strong entity, Disjoint and Overlapping for the designed ER/EER diagram.   (4 Marks)

Name Himanshu Dixit

Enrollment No. 21103202

Jaypee Institute of Information Technology, Noida
End Term Examination, 2022-2023
B.Tech III Semester

Course Title : Theoretical Foundation of Computer Science
Course Code : 15B11CI212

Maximum Time : 2 Hr
Maximum Marks : 35

C211.1 Apply the concepts of set theory, relations and functions in the context of various fields of computer science e.g. Database, Automata, Compiler etc.

C211.2 Evaluate Boolean Functions and Analyze algebraic structure using the properties of Boolean Algebra

C211.3 Convert formal statements to logical arguments and correlate these arguments to Boolean logic, truth tables, rules of propositional and predicate logic

C211.4 Apply the fundamental principle of counting, combinatorics, and recurrence relations to find the complex pattern and sequence in given datasets.

C211.5 Apply graph theory concepts for designing solutions of various computing problems e.g. shortest graph, graph coloring, job sequencing etc.

C211.6 Explain basic concept of automata theory and formal languages e.g., Finite Automata, regular expressions, context free grammars etc.

Ques 1: [C211.4, 4 marks] Solve the recurrence relation:

$$a_{n+2} + 3a_{n+1} + 2a_n = 3^n$$

where $n \geq 0, a_0 = 0, a_1 = 1$

Ques 2: [C211.1, 1+1 marks] For the given lattice A:
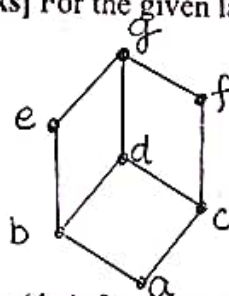
a) Find the removal of edge (d,g) from A will lost its lattice characteristics or not. Provide justification.

b) Find the removal of edge (b,d) from A will lost its lattice characteristics or not. Provide justification.
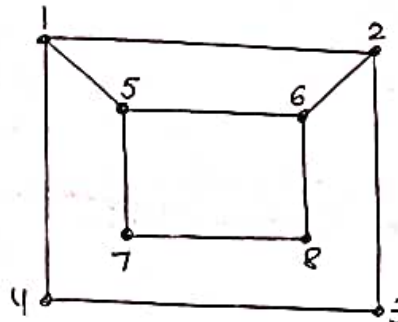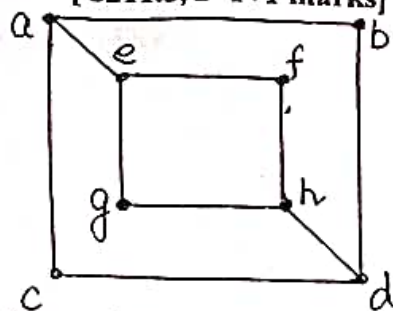
Ques 3: [C211.4, 3 marks] In the following figure, find the number of different ways by which 8 identical stones can be placed in small triangles 1,2,3,4 such that every triangle contains at least one stone.
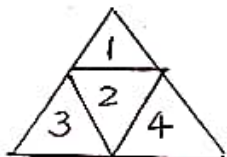
Ques 4: [C211.2, 4 marks] Let $Z_7^* = \{1,2,3,4,5,6\}$ with binary operation multiplication modulo 7 ($*_7$). Show that $(Z_7^*, *_7)$ is a cyclic group and list its generator(s)

Ques 5: [C211.5, 2+1+1 marks]

a) Check whether G1 and G2 are isomorphic or not.
b) Determine Hamiltonian path and Hamiltonian circuit in the graph G1 and G2.
c) Determine Euler path and Euler circuit in the graph G1 and G2.

Ques 6: [C211.5, 4 marks] There is a group of 6 people who need to travel to Delhi. The task is to assign them cars in such a manner that following constraints are satisfied:
i) The people with unfriendly terms will not travel in the same car.
ii) Ricky has unfriendly terms with Bob, Ron, Charlie and Lisa.
...) Lis. .... with Anthony, Ricky and Ron.
iv) Assign them cars using minimum .... '-r of cars.
What is the minimum number of cars required?

Ques 7: [C211.6, 4 marks] Construct the minimal state finite automata for vending machine. A vending machine accepts the request for providing snacks after certain amount of money is inserted into it. The specifications of machine are:
i) It receives coins of 1, 2 and 5.
ii) It accepts the request if the total amount of money inserted is greater than or equal to 5.
iii) It does not return money in case of higher amount is inserted.

Ques 8: [C211.6, 2+2+2 marks]

a) Write a regular expression that recognizes all the strings over $\Sigma = \{0,1\}$ which starts with '0' and ends with either '11' or '10'.
b) Design a NFA for this language.
c) Convert the NFA in part(b) to equivalent DFA.

Ques 9: [C211.6, 4 marks] Design a Moore machine that produces output 1 whenever sequence '0101' is the input. Convert the resultant Moore machine into Mealy machine.

Name Himanshu   Enrollment No. 21103262

Jaypee Institute of Information Technology, Noida
End Term Examination, 2022-2023
B.Tech III Semester

Course Title: Economics   Maximum Time: 2Hrs
Course Code: 15B11HS211   Maximum Marks: 35

CO1: Explain the basic micro and macroeconomic concepts.
CO2: Analyse the theories of demand , supply, elasticity and consumer choice in the market.
CO3: Analyse the theories of production, cost, profit and break even analysis.
CO4: Evaluate the different market structures and their implications for the behaviour of the firm.
CO5: Examine the various business forecasting methods.
CO6: Apply the basics of national income accounting and business cycles to Indian economy.

Q1. Mr. Paul owns and manages his own fruit stand. The financial information for the stand is given below (all values are monthly): **[CO1,3Marks]**

Wholesale fruit cost $2000   Fruit stand lease cost $1000
Labour cost $800   Monthly Revenue $5000

Answer the following based on the information provided.
a) Calculate the accounting profit.
b) If his other employment opportunity is to earn $1000 per month working at a t-shirt stand (he is equally happy selling fruit or t-shirt), what is his economic profit? Should he continue selling fruit?

Q2. Given $Q=700-2P+0.02Y$, where Price (P)=$25 and Income (Y)=$5000. Calculate: **[CO2,2Marks]**
a) the price elasticity of demand.
b) the income elasticity of demand.

Q3. Calculate the returns to scale and output elasticities of the inputs for the following production functions: **[CO3,3Marks]**
a) $Q=75 L^{0.60}K^{0.70}$
b) $Q= 50L+50K+50LK$
c) $Q= 50L^{2}+50K^{2}$

Q4. The following data given the height in inches (X) and the weight in lb. (Y) of a random sample of 6 students of age 17 years is: **[CO5,3Marks]**

X	61	68	68	64	65	70
Y	112	123	130	115	110	125

Estimate the weight of a student having height of 75 inches.

Q5. The demand and supply for the soft drinks are given by $Q=20-P$ and $Q=3P$ respectively. **[CO2,3Marks]**
a) Solve for the equilibrium price and quantity.
b) Suppose, the government imposes a per unit tax of $4 on the sellers. Solve for the new quantity, price received by the sellers and price paid by the consumers.
c) Calculate the government revenue from the taxation.

Q6. Suppose, concrete supplying industry is perfectly competitive and produces concrete at marginal cost $MC=10+Q$. If the industry is monopolized, the new marginal cost is $MC=14+Q$. The market demand for concrete is given by $P=50-4Q$. Calculate the dead weight loss resulting from the monopolization of the concrete industry. **[CO4,4Marks]**

Q7 Assume that a very large number of firms in an industry, all have the access to the same production technology. The total cost function of an individual firm associated with this technology is TC=400-24q+4q². The demand function for the industry product is Q=116-P. **[CO4,4Marks]**

a) Find the number of firms when the market is at its long run competitive equilibrium.

b) At a market price of $60 how much the firms will be willing to supply in the market?

Q8 Company A and B are selling similar petroleum products. The market demand curve for the petroleum products is given by P=140-q_1-q_2, where q_1 and q_2 are the quantities produced by company A and B respectively and P is the selling price. The short run total cost functions of A and B are: **[CO4,4Marks]**

$$TC_1=20q_1+q_1{}^2+30 \quad \text{and} \quad TC_2=30q_2+3q_2{}^2+40$$

Assume that company A and B form a cartel to act as a monopolist and maximize total industry profit.

a) Determine the profit maximizing price output combination of cartel and optimum output and selling price for each company.

b) Calculate the individual profit of both the companies along with profit of the cartel.

Q9. From the following data, calculate NNP at factor cost (National Income) by **[CO6,3Marks]**
a) Income method
b) Expenditure method

Sr. No	Items	Rs.(in crores)
1	Gross domestic capital formation	420
2	Interest	200
3	Rent	300
4	Private final consumption expenditure	1300
5	Government final consumption expenditure	730
6	Net exports	-20
7	Depreciation	60
8	Net factor income from abroad	-50
9	Profits	600
10	Compensation of employees	1200
11	Net indirect taxes	70

Q10 Explain the main characteristics of similarity and difference between a perfect competitor and a monopolistic competitor. **[CO4,2Marks]**

Q11. The business cycle allows people to understand the direction of the economy and plan accordingly. In the light of this statement explain different phases of business cycle. **[CO6,2Marks]**

Q12. Compare and contrast between demand pull and cost push inflation. **[CO6,2Marks]**