

**FACULTY OF ENGINEERING**  
**BE (CE/EE/Inst/M/P/AE) III – Semester (AICTE) (Main & Backlog) Examination,**  
**July 2021**

**Subject: Engineering Mechanics**

**Time: 2 hours**

**Max. Marks: 70**

**Note: Missing data, if any, may be suitably assumed.**

**PART – A**

**Answer any five questions.**

**(5x2 = 10 Marks)**

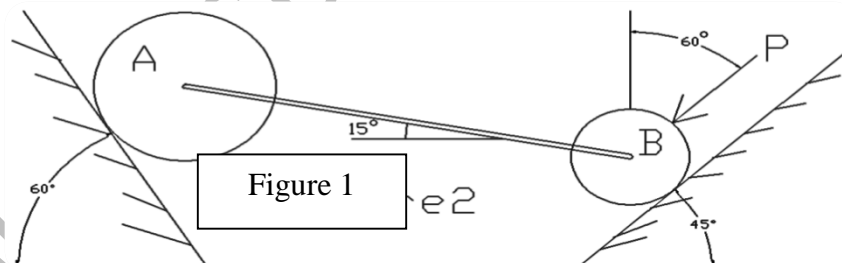
- 1 State and explain "Principle of transmissibility of force".
- 2 Explain the concept of "Free body diagram" with example.
- 3 Write any two differences between centroid and centre of gravity.
- 4 Calculate the radius of gyration if the radius circular section is 300 mm?
- 5 State the laws of friction.
- 6 When method of sections is preferred over method of joints in analysis of perfect frames?
- 7 A projectile is fired horizontally from a point 300 m above the ground with an initial velocity of 108m/sec. Find the range.
- 8 Define the terms kinematics and kinetics.
- 9 State and explain work energy principle for translation.
- 10 Define law of conservation of linear momentum.

**PART – B**

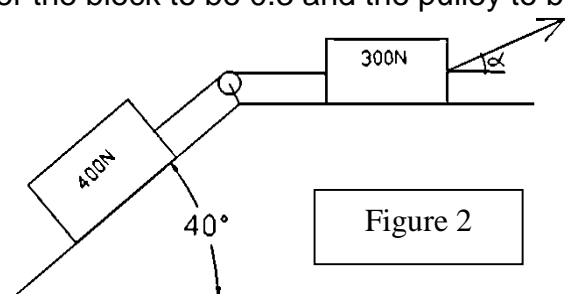
**Answer any four questions.**

**(4x15 = 60 Marks)**

- 11 Two cylinders A and B weighing 200N and 100N are connected by a bar of negligible weight and are resting on smooth planes as shown in figure 1. Find the force 'P' that will hold the system in equilibrium.

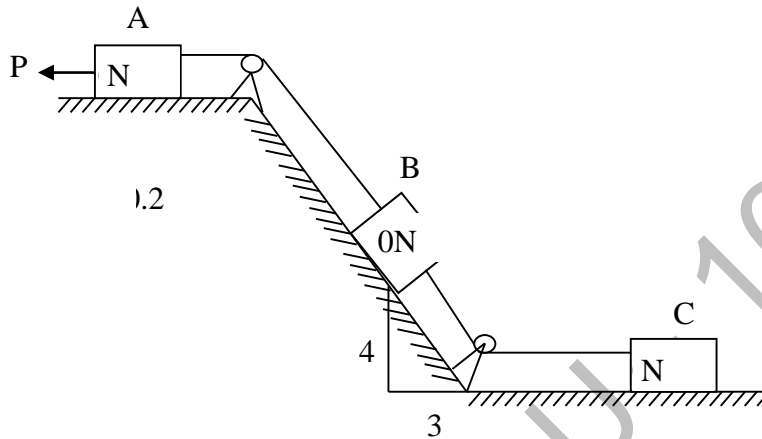


- 12 Determine the least value of the force 'P' to cause motion to impend rightwards. Assume the coefficient of friction under the block to be 0.3 and the pulley to be friction less, figure 2.

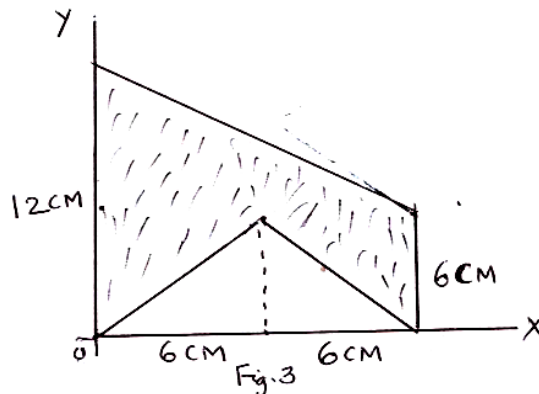


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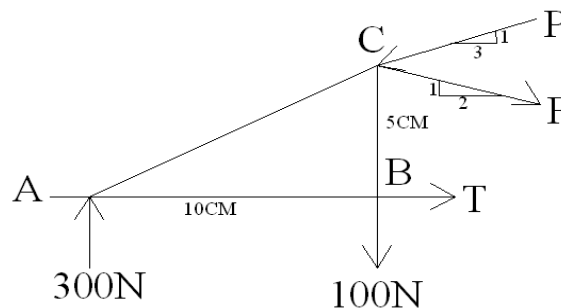
- 13 An I section consist 100mm x10mm top and bottom flanges connected by centrally placed web 10mmx 120mm. Determine the moment of inertia of the section about its both centroidal axes.
- 14 The rectilinear motion of a particle is governed by  $a = -8S^{-2}$  where 'a' is in  $m/s^2$  and "S" is in m. Where  $t = 1s$ ,  $s = 4m$  and  $v = 2 m/s$  . Determine the acceleration of the particle at  $t = 2$  sec.
- 15 Determine the constant force P that will give the system of bodies show in fig, velocity of 3 m/s after moving by 4.5 m from rest.



- 16 Find the CG of the shaded section shown I fig.3 about X and Y axis.



- 17 Determine the forces P, F and T required, to keep the triangular frame shown in fig in equilibrium.



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**FACULTY OF ENGINEERING**  
**BE III - Semester (ECE) (AICTE) (Main & Backlog) Examination, July 2021**

**Subject: Elements of Mechanical Engineering**

**Time: 2 Hours**

**Max .Marks: 70**

**Note: Missing data, if any, may be suitably assumed**

**PART – A**

**Answer any five questions.**

**(5x2=10 Marks)**

- 1 Detail the classification of Gas turbine.
- 2 What are the IC engines role in industries?
- 3 State the Stefan – Boltzmann Law of radiation.
- 4 List the advantages of heat exchangers.
- 5 Classify the different types of centrifugal pumps.
- 6 Draw the diagram of Francis turbines.
- 7 State two conditions on which belt drive is preferred over gear drive in power Transmission.
- 8 Define velocity ratio of a compound belt drive and slip of it.
- 9 State different types of welding.
- 10 Sketch any one drilling machine and mention important components.

**PART – B**

**Answer any four questions.**

**(4x15=60 Marks)**

- 11 (a) Explain with neat sketches working of four-stroke diesel engine.  
(b) Derive the specific fuel consumption of the petrol engine.
- 12 (a) Derive the methods of classification of Heat Exchangers.  
(b) Explain the modes of heat transfer in the following i) Metal rod is heated at 500C  
ii) Water is boiling at 100oC iii) Furnace wall is maintained at 800oC
- 13 Explain about Pelton wheel and explain the calculation of overall efficiencies.
- 14 (a) Compare compound gear train and Reverted gear train.  
(b) Derive the ratio of tensions of flat belt with neat diagram.
- 15 (a) Compare up milling and down milling.  
(b) Explain with a neat sketch the Oxy-Acetylene welding.
- 16 (a) Explain with a neat diagram the working of ARC welding system and also mention its engineering applications  
(b) The tension on tight side of a belt is 300kg and the angle of lap is 160°. If the coefficient of friction is 0.3 find the tension on the slack side of the belt.
- 17 (a) Explain the working of diesel engine with P-V diagram.  
(b) Explain the about counter flow heat exchangers.

**FACULTY OF ENGINEERING****B.E. III- Semester (AICTE)(CSE) (Main & Backlog) Examination, July 2021****Subject : Discrete Mathematics****Time : 2 Hours****Max. Marks: 70****Missing data, if any may be suitably assumed.****PART – A****Note: Answer any Five Questions****(5x2= 10 Marks)**

1. Write Truth Table for the Biconditional  $p \leftrightarrow q$
2. Write Mersenne Prime numbers.
3. How many permutations of the letters ABCDEFGH contain the string CDEF?
4. Use mathematical induction to prove that  $2^n < n!$  for every positive integer  $n$  with  $n \geq 4$
5. Let  $X$  be the number that comes up when a die is rolled. What is the expected value of  $X$ ?
6. A set contains 5 elements. Find the number of Derangements with 5 elements
7. What is Relational Database and differentiate between Primary Key and Composite Key
8. Compare Euler circuit and Euler Path, Hamiltonian circuit and Hamiltonian path
9. 'Construct DFS and BFS Graph for the figure 1.
10. Solve the following Boolean function using Boolean theorems

$$f(x, y, z) = x' y' z' + x' y' z + x y z' + x y z$$

**PART- B****Note: Answer any Four Questions****(4x15= 60 Marks)**

11. a) Describe the best and worstcase Time Complexity of Linear Search algorithm.  
b) A number is not known but when divided by 3, the remainder is 2; when divided by 5, the remainder is 3; when divided by 7, the remainder is 2; Find that number?
12. a) Get the coefficient of  $x^{12} y^{13}$  in the expansion of  $(2x - 3y)^{25}$   
b) Prove, by Mathematical Induction, that the sum of squares of the first  $n$  natural numbers is  $n(n+1)(2n+1)/6$
13. a) What is the variance of getting Heads as an outcome, where the outcome is the number of heads, when three fair coins are flipped?

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b) List all prime numbers not exceeding 100 by the principle of inclusion-exclusion.

14.a) Obtain the zero-one matrix of the transitive closure of the relation R where

$$M_R = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$$

b) Find the shortest path between the source node (A) and the destination node (H) from the given weighted Graph by using Dijkstra's algorithm

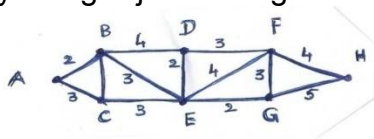


Fig- 1

15 .a) Derive a Minimum Spanning Tree from the given weighted Graph by using Kruskal's algorithm

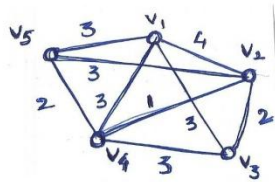


Fig- 2

b) Draw graphical symbols of XOR and XNOR gates and find the output if these gates are connected to an OR gate

16.a) Solve the recurrence relation  $a_n - 3a_{n-1} - 4a_{n-2} = 4^n$

b) Create a Minimum Spanning Tree from the following Graph by using DFS algorithm.

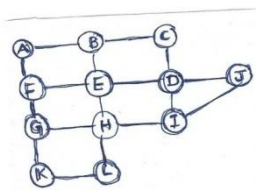


Fig- 3

17.a) Illustrate Select, Projection and Join operations on any n-relation on Databases.

b)  $a \equiv b \pmod{m}$  is an equivalence relation, Justify this, where a and b are integers and m is a positive integer  $> 1$ .

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**FACULTY OF ENGINEERING**

**B.E. III – Semester (AICTE) (CME) (Main) Examination, July 2021**

**Subject: Basic Electronics Engineering**

**Time: 2 Hours**

**Max.Marks: 70**

**Note: Missing data, if any, may be suitably assumed**

**PART – A**

**Answer any five questions.**

**(5x2=10 Marks)**

- 1 What is avalanche breakdown?
- 2 List the applications of cathode ray oscilloscope.
- 3 Draw symbols of NPN and PNP transistors. What does the arrow in it indicate?
- 4 Mention advantages of JFET over BJT.
- 5 List out the advantages of negative feedback amplifier.
- 6 What is meant by Barkhausen criteria?
- 7 What are the ideal characteristics of Op-amp?
- 8 What are universal gates and write their truth tables.
- 9 Define Gauge factor.
- 10 What are the advantages of thermocouple?

**PART – B**

**Answer any four questions.**

**(4x15=60 Marks)**

- 11 a) Explain V-I characteristics of PN junction diode under forward and reverse bias conditions.  
b) What is Zener diode? What is its application?
- 12 a) Explain the input and output characteristics of CE configuration.  
b) Draw and explain P-Channel FET V-I characteristics.
- 13 a) Derive the general equation for LC oscillator.  
b) Explain the working of collpits oscillator. Derive its frequency.
- 14 a) Design full adder circuit using only NAND gates.  
b) Explain the construction and working of CRO.
- 15 a) Derive ripple factor of half wave and full wave rectifier.  
b) List out the applications of LVDT?
- 16 a) Draw and explain the R-2R ladder type digital to analog converter.  
b) What is meant by seebeck effect?
- 17 Explain in detail the construction and working operation of linear variable differential transformer.

**FACULTY OF ENGINEERING**  
**BE III - Semester (IT) (AICTE) (Main & Backlog) Examination, July 2021**

**Subject: Mathematical Foundation of I.T**

**Time: 2 Hours**

**Max .Marks: 70**

**Note: Missing data, if any, may be suitably assumed**

**PART – A**

**Answer any five questions.**

**(5x2=10 Marks)**

- 1 Define predicate logic.
- 2 Differentiate between consistency and inconsistency.
- 3 What is composition of functions?
- 4 Define algebraic system.
- 5 How many different arrangements are their of the letter a,a,a,b,c.
- 6 Distinguish between permutation and combination?
- 7 What is recurrence relation?
- 8 Write the formal power series expression for  $1/(3+x)$ .
- 9 What is Hamiltonian graph?
- 10 Differentiate between BFS & DFS.

**PART – B**

**Answer any four questions.**

**(4x15= 60 Marks)**

- 11 (a) Explain proof of contradiction.  
 (b) Explain about rules of inference.
- 12 (a) Briefly explain about recursive function.  
 (b) Differentiate between homomorphism and Isomorphism.
- 13 (a) Explain the principle of Inclusion-Exclusion.  
 (b) 7 gentleman and 4 ladies committee of 6 is to form in how many ways can be done  
 i) When the committee contain exact 2 ladies.  
 ii) At least 2 ladies.
- 14 (a) Write an expression for ar is the coefficient of  $x^r$  in the following generating function  $A(x)$ .  

$$\frac{1}{1-x} + \frac{5}{1+2x} + \frac{7}{(1-x)^5}$$
  
 (b) Solve the recurrence relation  $a_n - 7a_{n-1} + 10a_{n-2} = 0$  for  $n \geq 2$ .
- 15 Discuss the following topics:  
 (a) Planar  
 (b) Sub graph of isomorphism
- 16 (a) Show that logically derived from  $p \rightarrow q$ ,  $q \rightarrow r$  and  $p$ .  
 (b) What is automatic theorem proving?
- 17 (a) Let  $G = \{-1, 0, 1\}$ . Verify whether  $G$  form a group under usual addition.  
 (b) If  $a, b$  are elements of  $M$  and  $a*b = b*a$  then  $(a*b)*(a*b) = (a*a)*(b*b)$  where  $(M, *)$  is an algebraic system.

**FACULTY OF ENGINEERING**  
**B.E. 2/4 (Civil) I – Semester (Backlog) Examination, July 2021**

**Subject: Strength of Materials – I**

**Time: 2 hours**

**Max. Marks: 75**

**Note: Missing data, if any may be suitably assumed.**

**PART – A**

**Answer any seven questions.**

**(7x3 = 21 Marks)**

- 1 Differentiate between ductile material and brittle material with an example.
- 2 Write the relation between elastic constants.
- 3 Define shear force and bending moment.
- 4 Derive a relation between load, shear force and bending moment.
- 5 Sketch the shear stress variation for a beam of cross section 'equal I'. Indicate the position of maximum shear stress.
- 6 Explain the method of sections.
- 7 State the differences between thin cylinder and thick cylinder.
- 8 What is a compound cylinder?
- 9 Draw a Mohr's circle of stress for a cube under water at a depth of 2 km.
- 10 What is torque?

**PART – B**

**Answer any three questions.**

**(3x18 = 54 Marks)**

- 11 A vertical uniform rod of 3 m long is rigidly fixed at upper end and carries an axial tensile load of 50 kg at lower end. Diameter of the rod is 20 mm. Estimate total extension of the rod and maximum stress induced in the rod. Also draw the variation of axial stress along the length of the rod. Take density of material of the rod and Young's modulus as  $0.75 \times 10^5 \text{ kg/m}^3$  and 205 GPa respectively.
- 12 A steel bar is placed between two copper bars, each having the same area and length as steel bar at  $25^\circ\text{C}$ . At this stage, they are rigidly connected together at both the ends. When the temperature is raised to  $50^\circ\text{C}$ , the length of the bar increases by 1 mm. Determine the original length and final stresses in the bars.  
 Take  $E_s = 200 \text{ GN/m}^2$  and  $E_c = 100 \text{ GN/m}^2$ .  $\alpha_s = 12 \times 10^{-6} /^\circ\text{C}$ ,  $\alpha_c = 17 \times 10^{-6} /^\circ\text{C}$
- 13 The intensity of loading on a simply supported beam of 5 m span varies gradually from zero at one end to 4 kN/m at the other end. Draw the shear force diagram and bending moment diagram. Also find the position and magnitude of maximum shear force and bending moment.
- 14 A 200 mm wide and 300 mm deep timber beam is strengthened with 4 mm thick and 200 mm wide steel plate at the bottom. Take modular ratio as 20. Draw equivalent timber section. Determine flexural stresses at extreme fibers of timber and steel, if the section is subjected to a bending moment of 60 kNm. Draw flexural stress distribution diagram for the above section.

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- 15 An I-section of a beam has the following dimensions. Flange width: 200 mm, Overall depth: 600 mm, Thickness of web: 10 mm, Thickness of flange: 30 mm. Determine the maximum shear stress in the beam, when a shear force of 50 kN is applied. Also sketch the shear stress variation.
- 16 At a point in a beam the longitudinal tensile stress is 80 MPa and the shear stress is 40 MPa. Find the magnitude and direction of principal stresses at the point. What is the magnitude and direction of the greatest shear stress? Estimate the normal stress on greatest shear plane.
- 17 A shaft is required to transmit 300 kW power at 100 r.p.m. The maximum torque may be 2 times the mean torque. The shear stress in the shaft should not exceed  $60 \text{ N/mm}^2$  and twist  $1.5^\circ$  per metre length. Determine the diameter required if
- The shaft is solid
  - The shaft is hollow with external diameter twice the internal diameter

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**FACULTY OF ENGINEERING**  
**BE II/IV (EEE) I- Semester (Backlog) Examination, July 2021**

**Subject: Principles of Mechanical Engineering**

**Time: 2 Hours**

**Max .Marks: 75**

**Note: Missing data, if any, may be suitably assumed**

**PART – A**

**Answer any seven questions.**

**(7x3=21 Marks)**

- 1 Define reversible and irreversible processes.
- 2 Give the modes of heat transfer with example each.
- 3 Define COP in refrigeration.
- 4 Give the advantages of petrol engine.
- 5 list out types of compressors.
- 6 Give the difference between reciprocating pump and centrifugal pump.
- 7 Which gears are used for low speed applications?
- 8 Define slip and creep in belt drives.
- 9 write down the Hagen's formula.
- 10 write the importance of characteristic curves.

**PART – B**

**Answer any three questions.**

**(3x18= 54 Marks)**

- 11 (a) Explain the working of 4 stroke diesel engine with a neat sketch and draw its P-V diagrams.  
(b) Explain the working of brayton cycle in gas turbine with a neat sketch.
- 12 (a) Derive the one dimensional steady state conduction equation for heat transfer through plane wall without heat generation.  
(b) Derive the expression of LMTD in parallel flow heat exchangers.
- 13 Explain the working principle of the following with a neat sketch.  
(a) Reciprocating pump  
(b) Centrifugal pump
- 14 (a) Explain the working of a inverted gear train with neat sketch and give its applications  
(b) Derive the expression for the length of cross belt drive.
- 15 (a) Describe the working of venturi-meter and orifice meter with neat sketch.  
(b) Give the significance of Reynolds number.
- 16 (a) Explain the working principle of pelton wheel hydraulic turbine.  
(b) Explain the unit quantities of hydraulic turbines.
- 17 Write short note on the following:  
(a) Air Vessels in Pumps  
(b) Properties of refrigerants  
(c) Critical radius of insulation

**FACULTY OF ENGINEERING****B.E. II/IV (EIE) I – Semester (Backlog) Examination, July 2021****Subject: Elements of Production Techniques****Time: 2 Hours****Max.Marks: 75****Note: Missing data, if any, may be suitably assumed****PART – A****Answer any seven questions.****(7x3=21 Marks)**

- 1 Give the classification of casting processes.
- 2 What are the different types of patterns used in casting process?
- 3 What is resistance spot welding?
- 4 Write about soldering operation.
- 5 Write the different types of operations can be performed on milling machine.
- 6 Explain the drilling operation.
- 7 What is FMS?
- 8 Write the applications of electro discharge machine.
- 9 Write the advantages of rolling operations.
- 10 Write the concept of deep drawing.

**PART – B****Answer any three questions.****(3x18=54 Marks)**

- 11 a) Explain the Die casting operation and write its applications.  
b) Write the different types of procedures to make sand moulds.
- 12 a) Differentiate the brazing and soldering processes.  
b) Explain the concept of resistance spot welding.
- 13 a) Write the difference between consumable and Non-Consumable electrodes.  
b) Explain different types of butt welds with a neat sketch.
- 14 a) Explain the working of lathe machine with help of a neat sketch.  
b) Enlist different types of operations that can be performed on CNC.
- 15 Explain the working of:
  - a) Gear cutting machine.
  - b) Shaping machine.
- 16 a) Explain the process of extrusion with a neat sketch.  
b) Explain the need for unconventional machining processes.
- 17 Write short notes on:
  - (a) Wire drawing process
  - (b) Powder metallurgy

**FACULTY OF ENGINEERING**  
**B.E. 2/4 (ECE) I – Semester (Backlog) Examination, July 2021**

**Subject: Elements of Mechanical Engineering**

**Time: 2 hours**

**Max. Marks: 75**

**Note: Missing data, if any, may be suitably assumed.**

**PART – A**

**Answer any seven questions.**

**(7x3 = 21 Marks)**

- 1 In what ways are the energy transfer as work and heat (a) similar b) different? State with examples.
- 2 What is PPMI?
- 3 Define heat transfer and give the different modes of heat transfer with examples.
- 4 Define LMTD.
- 5 Give the relationship between COP of heat pump and refrigerator.
- 6 What do you mean by psychometry?
- 7 Give the differences between soldering and brazing.
- 8 Give the differences between forging and rolling.
- 9 Define kinematic link and pair.
- 10 Give the classification of belts and rope drive.

**PART – B**

**Answer any three questions.**

**(3x18 = 54 Marks)**

- 11 a) Write the conditions for steady flow system.  
 b) A heat engine operates on Carnot cycle between source and sink temperatures  $227^{\circ}\text{C}$  and  $27^{\circ}\text{C}$  respectively. If the heat engine receives 400 KJ from the sources, find the network done, heat rejected to the sink and efficiency of the engine.
- 12 a) State the Fourier's law of heat conduction. Calculate the rate of heat loss for a red brick wall of length 5m, height 4m and thickness 0.25m, the temperature of the inner surface is  $110^{\circ}\text{C}$  and that of the outer surface is  $40^{\circ}\text{C}$ . The thermal conductivity of red brick,  $k$  0.07 W/mK. Calculate also the temperature at an interior point of the wall, 20 cm distance from the inner wall.  
 b) Derive an expression for LMTD of a parallel flow heat exchanger.
- 13 a) What are the advantages and disadvantages of air cycle refrigeration over vapor compression cycle.  
 b) With the help of a neat block diagram, explain the working of simple vapor compression refrigeration system. Show the cycle on T-S and P-H diagrams.
- 14 a) Explain the different gas flames with a neat sketch.  
 b) Explain the principle of arc welding. Give the list of equipments required for the electric arc welding.
- 15 a) Derive an expression for length of open belt drive.  
 b) Explain epi-cycle gear train and mention its advantages.
- 16 a) Explain the principle of die casting.  
 b) Explain Wire-drawing operation.
- 17 Write short notes on:
  - a) Properties of refrigerants
  - b) Discuss about types of heat exchangers.

**FACULTY OF ENGINEERING**  
**B.E. 2/4 (M/P / AE) I - Semester (Backlog) Examination, July 2021**

**Subject: Managerial Economics and Accountancy**

**Time: 2 Hours**

**Max. Marks: 75**

**(Missing data, if any, may be suitably assumed)**

**PART – A**

**Note: Answer any seven questions.**

**(7x3 = 21 Marks)**

- 1 What are the uses of managerial economics?
- 2 State about discounting principle.
- 3 What do you mean by cross elasticity of demand?
- 4 What is the law of supply?
- 5 Define Isoquants.
- 6 Distinguish between AR and MR.
- 7 What are the sources of capital?
- 8 Recall profitability index.
- 9 Mention any two objectives of accounting.
- 10 Tell about the importance of ratio analysis.

**PART – B**

**Note: Answer any three questions.**

**(3x18 = 54 Marks)**

- 11 Explain the various economic tools and principles used in managerial economics.
- 12 Define demand. Explain the law of demand.
- 13 Discuss the nature of cost curves in the short-run along with its diagrams.
- 14 Explain various forms of internal economies of scale.
- 15 A company sells 14000 units at Rs.54 per unit. Its fixed cost is Rs.88000 and variable cost is Rs.32 per unit. Calculate
  - (1) P/V Ratio
  - (2) Break-Even units and sales
  - (3) Margin of safety.
- 16 What is capital budgeting? What are the methods available for selection and making of investment proposals?
- 17 Prepare Trading, Profit and Loss account and Balance Sheet from the following.

Particulars	Debit (Rs.)	Credit (Rs.)
Fixed assets	50,000	-
Creditors	-	25,000
Opening stock	10,000	-
Bank overdraft	-	25,000
Purchases and Sales	90,000	1,30,000
Capital account	-	20,000
Debtors	12,000	-
Salaries	20,000	-
Rent and taxes	8000	-
Freight inwards	10,000	-
Total	2,00,000	2,00,000

**FACULTY OF ENGINEERING****B. E. 2/4 (CSE) I – Semester (Backlog) Examination, July 2021****Subject: Basic Electronics****Time: 2 hours****Max. Marks: 75****Note: (Missing data, if any, may be suitably assumed)****PART – A****Answer any seven questions****(7 x 3 = 21 Marks)**

1. Explain the breakdown mechanism in a reverse biased diode.
2. What are the applications of diode?
3. What is an op-amp? List four building blocks of an op-amp.
4. Define the  $\alpha$  and  $\beta$  of a transistor. Derive the relation between them.
5. What are advantages of the negative feedback over positive feedback?
6. Define LED and photodiode.
7. What are the ideal characteristics of operational amplifiers?
8. What are the universal gates? Give the truth tables.
9. Draw the frequency versus gain characteristics of an amplifier with and without negative feedback.
10. What are the applications of CRO?

**PART – B****Answer any three questions.****(3 x 18 = 54 Marks)**

11. a) Draw the V-I characteristic of PN junction diode. Explain the current equation related to its characteristics.  
b) With the help of neat sketch explain full wave rectifier and derive ripple factor
12. a) Draw the circuit diagram of CE amplifier and explain its working. Analyze with h-parameter equivalent circuit.  
b) Why does a transistor has a low input-resistance and high output resistance?
13. a) Explain the operation of JFET with V-I characteristics.  
b) Explain how does a Zener diode behaves as a voltage regulator.
14. Draw the RC phase shift oscillator? Derive the expression for frequency of oscillator.
15. a) Draw the circuit diagram of RC phase shift oscillator and explain its operation by deriving expression for frequency of oscillation.  
b) A phase shift oscillator using a transistor has the parameter value  $R_c=3.3k\Omega$  and  $C=0.01\mu f$  calculate the frequency of oscillator and the  $h_o$  required to sustaining the oscillations.
16. a) What is meant by LVDT? Explain the working principle of LVDT.  
b) With the help of a circuit diagram explain the V-I characteristics of UJT. Why negative resistance region is present in UJT.
17. Write short notes on  
a) Photo diode and transistor. (b) Full subtractor (c) Skew rate in op-amp

**FACULTY OF ENGINEERING****B.E. 2/4 (I.T) I – Semester (Backlog) Examination, July 2021****Subject: Data Structures****Time: 2 hours****Max. Marks: 75****Note: Missing data, if any, may be suitably assumed.****PART – A****Answer any seven questions.****(7x3 = 21 Marks)**

- 1 Write the Array ADT.
- 2 Describe what is meant by Data abstraction and Encapsulation.
- 3 List the various operations that can be performed on linear lists.
- 4 Write the String ADT.
- 5 Define the mid-square hash function with the help of an example.
- 6 Draw a doubly linked list with the following elements: 10, 20, 30, 40.
- 7 Define AVL tree.
- 8 Draw a threaded binary tree with at least 5 elements.
- 9 Trace the working of Insertion sort on the following array of 5 elements: 25, 34, 12, 5, 8.
- 10 Define minimum cost spanning tree on a graph.

**PART – B****Answer any three questions.****(3x18 = 54 Marks)**

- 11 a) What is asymptotic notation for algorithm analysis? Describe the three notations for best, worst and average case of performance of an algorithm.  
b) Write a function to perform binary search on an Array using recursion. Write its best case time complexity.
- 12 a) Write and explain the Polynomial ADT using Array.  
b) Explain how arrays are represented inside the computer memory. Write the addressing formulae for 1D, 2D and 3D arrays.
- 13 a) Write a C++ program to convert an infix expression to postfix form.  
b) Convert the following infix expression to postfix form:  $A+B*(C+D)/F+D*E$ .
- 14 Write a C++ program to implement circular linked list ADT.
- 15 a) Write a C++ function to perform search operation on a binary search tree.  
b) Construct a min-heap by inserting the following elements in the order specified: 10, 75, 35, 2, 89, 22, 31.
- 16 a) Write a program to implement quick sort. Show its tracing on the following array of elements: 121, 25, 37, 21, 601, 124, 59, 10.  
b) Write a C++ function to implement BFS traversal of a graph.
- 17 Write notes on:
  - a) Red-Black Trees
  - b) B-Trees.

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**FACULTY OF ENGINEERING****B.E. (Civil) III-Semester (CBCS) (Backlog) Examination, July 2021****Subject : Strength of Materials-I****Time: 2 hours****Max. Marks: 70****Note: Missing data, if any, may be suitably assumed.****PART – A****Answer any five questions.****(5x2 = 10 Marks)**

- 1 What are brittle materials? Give example.
- 2 Define Poisson's ratio and give the relation between Modulus of elasticity, Shear modulus and Poisson's ratio.
- 3 Draw bending moment diagram for a cantilever beam of span 3m subjected to a uniformly distributed load of 20 kN/m over the entire span.
- 4 A beam of rectangular section is 150mm wide and 300mm deep. Calculate the maximum shear stress and sketch the shear stress distribution across the section.
- 5 State any two assumptions of simple bending in beams.
- 6 What is core of a section? Sketch the core of a circular section.
- 7 A thin cylinder of 600mm internal diameter is subjected to an internal pressure of 4 N/mm<sup>2</sup>. Calculate the thickness of cylinder if the permissible tensile stress is 120 N/mm<sup>2</sup>.
- 8 Sketch the radial pressure and hoop stress distribution across the thickness of a cylinder and write relevant equations.
- 9 Explain unsymmetrical bending in beams.
- 10 Define shear flow and sketch the shear flow for I-section.

**PART – B****Answer any four questions.****(4x15 = 60 Marks)**

- 11 A circular bar of 20mm diameter and 1.5m long is subjected to an axial load of 80kN. The change in diameter is  $7.64 \times 10^{-3}$ mm. Calculate (i) Elongation of the bar (ii) Poisson's ratio (iii) Bulk Modulus. Take  $E=200$  GPa.
- 12 A Simply supported beam 8m long is subjected to a uniformly distributed load of 20kN/m over the entire span and a point load of 60 kN acting at 2m from left support. Draw shear force and bending moment diagrams.
- 13 Sketch the shear stress distribution across a T-section whose flange is 120mm x 10mm and web is 150mm deep with 10mm thickness, subjected to a shear force of 180 kN.
- 14 A point in a strained material is subjected to direct stresses of 180 N/mm<sup>2</sup> (tensile) and 60 N/mm<sup>2</sup> (comp). It is also accompanied by a simple shear stress of 40 N/mm<sup>2</sup>. Calculate Principal stresses, maximum shear stress and position of Principal planes.



-2-

- 15 A hollow circular column of 100mm external diameter and 80mm internal diameter is subjected to an axial load of 90 kN and an eccentric load of 60kN. Find the maximum eccentricity of 60 kN load so as to produce no tension at the base of the column.
- 16 A compound cylinder is made by shrinking a cylinder of external diameter 200mm and internal diameter 160mm over another cylinder of internal diameter 120mm and 20mm thick. The radial pressure at the junction after shrinking is  $12\text{N/mm}^2$ . Find the final stresses across the section when the compound cylinder is subjected to an internal fluid pressure of  $60\text{N/mm}^2$ .
- 17 A cantilever beam 3m long is subjected to point load of 2kN at its free end inclined at  $30^\circ$  with vertical as shown in fig. below. Calculate the stress at any one outside corner.

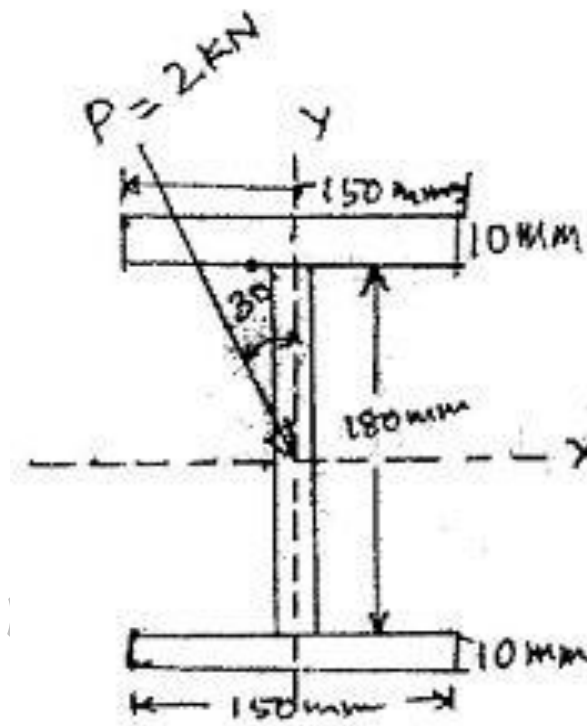


Fig.

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## FACULTY OF ENGINEERING

B. E. III – Semester (CBCS) (EEE) (Backlog) Examination, July 2021

Subject: Electrical Circuits - I

Time: 2 hours

Max. Marks: 70

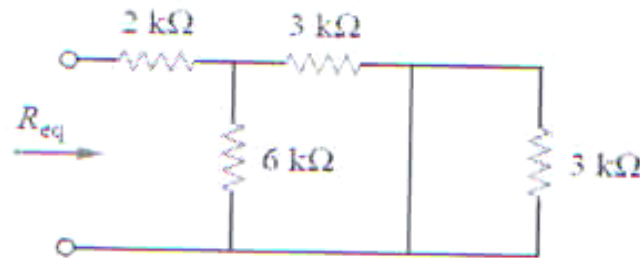
Note: Missing data, if any, may be suitably assumed.

## PART – A

Answer any five questions.

(5x2 = 10 Marks)

1. Distinguish between Active and Passive elements and give examples.
2. The equivalent resistance of the circuit is.



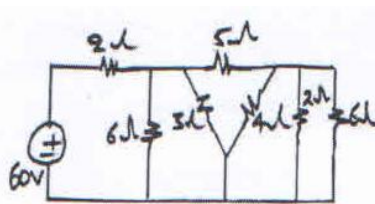
3. Define RMS and Average value of alternating quantity.
4. Define Bandwidth and quality factor.
5. State Norton's theorem.
6. State Millman's theorem.
7. Compare star and delta connections of a 3-phase system in any three aspects.
8. Differentiate between self and mutual inductance.
9. Discuss response of RC circuit.
10. What is the difference between steady response and transient response?

## PART – B

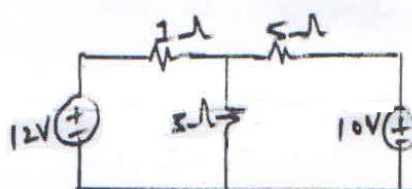
Answer any four questions.

(4x15 = 60 Marks)

11. Determine the current drawn by the circuit shown below.

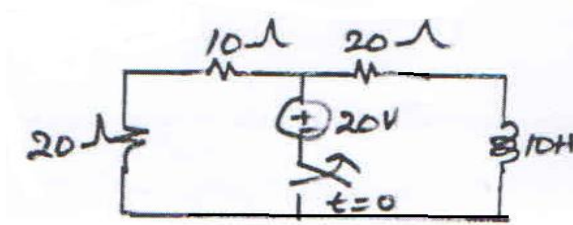


12. A series connected RLC circuit consists of a resistance of  $10\Omega$ ,  $0.1\text{H}$  inductance and  $10\mu\text{F}$ . Determine the impedance at resonance frequency,  $10\text{ Hz}$  above resonance frequency, and  $10\text{ Hz}$  below resonant frequency.
13. Write procedure for solving circuit using Thevenin's theorem and calculate current through  $3\Omega$  resistors in the circuit shown below by Thevenin's equivalent.

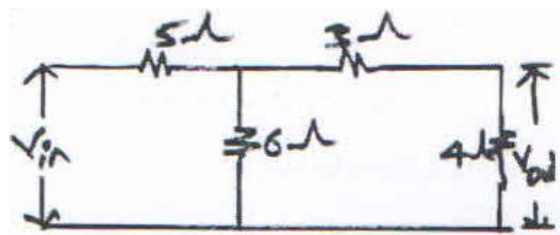


14. A balanced RYB phase sequence star connected with  $V_{RN}=100\angle 10^\circ\text{V}$  is connected to a delta connected balanced load  $(8+j4)\Omega$  per phase. Calculate the phase and line currents.

15. Find the expression for the current in the inductor as shown in the circuit below.



16. Determine the voltage ratio  $V_{out}/V_{in}$  for the circuit shown in the below circuit by using Nodal Analysis.



17. Derive the quality factor of series connected RLC circuit at resonance.

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## FACULTY OF ENGINEERING

B.E. (Inst.) III – Semester (CBCS) (Backlog) Examination, July 2021

Subject: Network Theory

Time: 2 hours

Max. Marks: 70

Note: Missing data, if any, may be suitably assumed.

## PART – A

Answer any five questions.

(5x2 = 10 Marks)

- 1 Find the capacitance of a circuit in which an applied voltage of 20 V gives an energy store of 0.3J.
- 2 Differentiate between dependent sources and independent sources.
- 3 Define time constant of RC circuit.
- 4 What is Transient?
- 5 A Sine wave has a peak value of 40 V determine the RMS value and average value.
- 6 An alternating circuit takes a power of 4.2 Kw at a power factor of 0.6 lagging. Find
  - i) Apparent power
  - ii) Reactive power
- 7 A series RTLC circuit consists of  $50\Omega$  resistance, 0.2H inductance and  $10\mu\text{F}$  capacitance with an applied voltage of 20V determine resonant frequency.
- 8 List advantages of three phase system over single phase system.
- 9 Define Z-parameters of two port Network and write them in a matrix.
- 10 The Z-parameters of circuit are  $Z_{11}=4\Omega$ ,  $Z_{12}=Z_{21} = 10\Omega$ ,  $Z_{22}=6\Omega$  and obtain transmission parameters.

## PART – B

Answer any four questions.

(4x15 = 60 Marks)

- 11 a) State and explain Norton's Theorem.
- b) For the circuit shown in figure 1 use superposition theorem to compute current I.

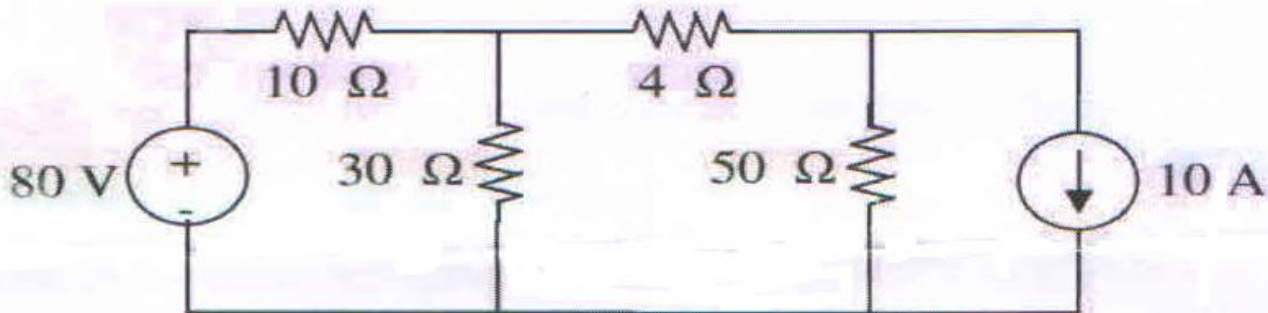


Figure 1

- 12 a) Describe the Transient response and steady state response in detail.
- b) A constant voltage of 100V is applied at  $t=0$  to a series RC circuit having  $R=5\text{M}$  and  $C=20\mu\text{F}$  assuming no initial charge to the capacitor, find the expression for current voltage across R and C.
- 13 a) A resistance of  $10\Omega$  an inductance of 150 mH and a capacitor of  $100\mu\text{F}$  are connected in parallel across a 50V, 50Hz source. Find the branch currents and total current and draw the phasor diagram.
- b) Find the form factor and peak factor of a full wave rectified voltage.

- 14 a) A balanced delta connected load of  $(2+j3)\Omega$  per phase is connected to a balanced three phase 440V supply the phase current is 10A. Find the (i) Active power (ii) Reactive Power (iii) Apparent power.
- b) Calculate the half power frequencies, resonant frequency, Band width and quality factor for series RLC circuit with  $R=0.2\Omega$ ,  $L=100\text{ mH}$  and  $C=50\mu\text{ F}$ .
- 15 a) Find out the combined parameters when 2 numbers of two port networks are connected in series.
- b) Find the transmission parameters for the circuit shown in Figure 2.

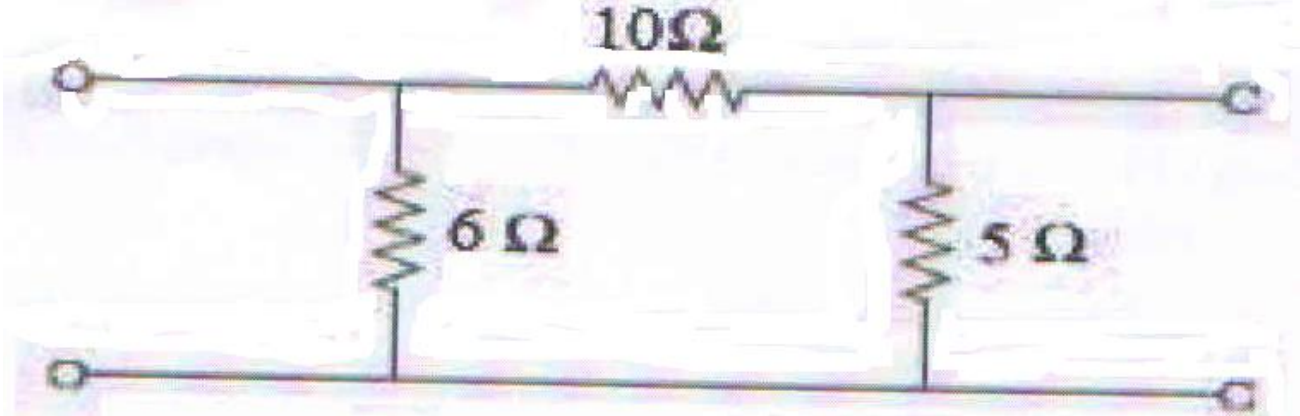


Figure 2

- 16 a) Discuss about Star-delta transformation.
- b) Two coils connected in series have an equivalent inductance of 0.6H, when they are connected in aiding and equivalent inductance of 0.4H when connected in opposition calculate Mutual inductance.
- 17 Write short notes on the following:
- Parallel resonance
  - Terminated two ports.

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**FACULTY OF ENGINEERING**  
**BE III - Semester (ECE) (CBCS) (Backlog) Examination, July 2021**

**Subject: Signal Analysis & Transform Technique**

**Time: 2 Hours**

**Max .Marks: 70**

**Note: Missing data, if any, may be suitably assumed**

**PART – A**

**Answer any five questions.**

**(5x2=10 Marks)**

- 1 Check whether  $x(t) = \sin t$  is even or odd?
- 2 Draw the sketch for folded and shifted unit ramp signal  $r(t)$ .
- 3 Determine the signal  $\cos 2t$  are orthogonal or not with  $\sin 2t$  over  $0$  to  $2\pi$ .
- 4 Find the Laplace transform of  $f(t) = e^{-4t} u(t)$ .
- 5 What is meant by convolution?
- 6 Check whether the system  $y(t) = n x(t)$  is Time Invariant or Variant ?
- 7 Find the Fourier transform of  $f(t) = u(t)$ .
- 8 Define Sampling.
- 9 State initial and final value theorem in Z-transform.
- 10 Find the Z-transform of  $x(n) = \{-2, 8, 5, 7\}$ .

**PART – B**

**Answer any four questions.**

**(4x15= 60 Marks)**

- 11 (a) Check whether the system  $y(t) = x(t^2)$  are linear or not and Time Invariant or Time variant .  
 (b) Sketch time shifting, time reversal, amplitude reversal and amplitude scaling for  $u(t)$  with functional representation.
- 12 (a) Obtain the Trigonometric Fourier series for the saw tooth wave.  $f(t) = 2t ; 0 < t < 1$   
 (b) What are the analogy between vectors and signals?
- 13 (a) Find the Fourier transform of  $f(t) = \text{sgn}(t)$ .  
 (b)  $\left[ \frac{d^2 y(t)}{dt^2} - 3 \frac{dy(t)}{dt} - 18 y(t) \right] = x(t)$ ; assume zero initial conditions .
- 14 For the given  $x(n) = \{2, 1, 4, 3, 5\}$  and  $h(n) = \{1, 3, 2, 1\}$ . Find the linear convolution using graphical Method.
- 15 (a) Find the Z - transform for  $x(n) = (1/4)^n u(n) + (1/5)^n u(n)$  and plot its ROC.  
 (b) Determine the step response for the system described by the difference equation  $y(n+2) + 5 y(n+1) - 14 y(n) = x(n)$ . Assume zero initial condition.
- 16 (a) Find the inverse Z-Transform for  $X(Z) = \frac{\begin{pmatrix} 1 & -1 \\ 1 + 5 & z \end{pmatrix}}{\begin{pmatrix} -1 & -2 \\ 1 - 8 & z - 48 \end{pmatrix}}$ , if Roc :  $|z| > 12$   
 (b) State and prove any three properties of Laplace transform.
- 17 (a) Differentiate Laplace transform and Z transform.  
 (b) Write a notes on Dynamic system  
 (c) State and prove the properties of cross correlation.

**FACULTY OF ENGINEERING**

**B.E III - Semester (CBCS) (M/P)(Backlog) Examination, July 2021**

**Subject: Metallurgy and Material Science**

**Time: 2 hours**

**Max. Marks: 70**

**Note: Missing data, if any, may be suitably assumed.**

**PART – A**

**Answer any five questions.**

**(5x2 = 10 Marks)**

- 1 Distinguish between edge and screw dislocation.
- 2 Define the term "Fracture". List various types of fracture.
- 3 Define "Fatigue" List the factors effecting fatigue.
- 4 State FICK'S LAWS of diffusion.
- 5 What is phase diagram? What is its significance?
- 6 What are the different types of cast irons?
- 7 What is the purpose of heat treatment and how is it different from alloying?
- 8 How Nitriding is different from carburizing?
- 9 What is HSS? List some of its applications.
- 10 What is the difference between acid and basic steel making?

**PART – B**

**Answer any four questions.**

**(4x15 = 60 Marks)**

- 11 a) What are the point defects found in solid materials? Explain with suitable sketches.  
b) Explain the Griffith theory of brittle fracture.
- 12 a) What is low cycle fatigue? Explain the method to estimate the fatigue damage in metals.  
b) What is creep? Explain the three stages of creep with the help of a neat diagram.
- 13 a) Draw and explain a typical equilibrium diagram for two metals completely soluble in liquid and solid states. Name the various phases in the diagram.  
b) What is chilled cast iron? Describe its properties and applications.
- 14 a) What is age hardening? Describe different steps in age hardening.  
b) Explain the need of tempering hardened steel. Describe the process of tempering.
- 15 a) What is stainless steel? How are they classified? Give their applications.  
b) What is meant by L.D process? How does it differ with Bessemer process?
- 16 a) Explain the effect of important alloying elements on properties of steel.  
b) What is the principle of surface hardening? Explain flame hardening process.
- 17 Write short notes on the following.
  - (a) Orange peel effect
  - (b) Stress Rupture curve
  - (c) Plain carbon steels

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**FACULTY OF ENGINEERING****B.E. (A.E.) III-Semester (CBCS) (Backlog) Examination, July 2021****Subject : Thermal Engineering****Time: 2 hours****Max. Marks: 70****Note: Missing data, if any, may be suitably assumed.****PART – A****Answer any five questions.****(5x2 = 10 Marks)**

- 1 Explain the process of irreversibility.
- 2 Define Zeroth law of thermodynamics
- 3 Define two statements of Second Law of Thermo dynamics
- 4 Explain the non-flow process.
- 5 How fuels used in closed cycle gas turbines
- 6 define clearance ratio in compressor
- 7 Define COP of a refrigerator
- 8 What do you understand by PMM1
- 9 Define Heat pump and Heat Engine
- 10 List advantages of Hybrid vehicle.

**PART – B****Answer any four questions.****(4x15 = 60 Marks)**

- 11 a) What is meant by thermo dynamic equilibrium? Explain with the help of examples.  
b) What is meant by SFEE and derive it and reduce it for the turbine.
- 12 A blower handles 1 kg/s of air at 200°C and consuming power of 15kw. The inlet and outlet velocities of air are 100m/s and 150 m/s respectively. Find the exit air temperature assuming adiabatic conditions. Take Cp of air as 1.005 KJ/Kg K.
- 13 a) Prove the equivalence of Kelvin plank and clausis. Statements.  
b) Discuss the first law of thermodynamics and its limitations.
- 14 With the help of neat sketch explain the working principle a Regeneration cycle in gas turbine and represent the cycle on T-S Diagram.
- 15 a) Explain working principle of vapour absorption refrigeration system with neat sketch and write its advantages.  
b) List the Desirable. Properties of a refrigerant.
- 16 a) Explain multi stage compression and write its advantages.  
b) Explain with sketch working principle of reciprocating air compressor.
- 17 Explain with neat sketches about the hybrid vehicle and that cell vehicle.

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## FACULTY OF ENGINEERING

B.E. (CSE) III-Semester (CBCS) (Backlog) Examination, July 2021

Subject : Discrete Mathematics

Time: 2 hours

Max. Marks: 70

Note: Missing data, if any, may be suitably assumed.

## PART – A

Answer any five questions.

(5x2 = 10 Marks)

- 1 Write truth table for  $(p \leftrightarrow q) \vee (\neg q \leftrightarrow r)$
- 2 What is quantifier? Give an example.
- 3 How many derangements are possible with 4 objects?
- 4 Define Pigion-hole principle.
- 5 What does solution and initial conditions in recurrence relation mean?
- 6 What is the reason to use recurrence relation?
- 7 What is Semi-group?
- 8 Define Group and give an example.
- 9 Explain about graph coloring problem.
- 10 Differentiate between tree and Spanning tree.

## PART – B

Answer any four questions.

(4x15 = 60 Marks)

- 11 a) Show that composition of homomorphisms is homomorphism  
b) State and Prove Fundamental theorem of arithmetic
- 12 Let  $f(x) = x+2$ ,  $g(x) = x-2$ ,  $h(x) = 3x$  and  $x$  belongs to  $\mathbb{R}$  ( $\mathbb{R}$ -Real numbers).  
Find  $\text{gof}$ ,  $\text{fog}$ ,  $\text{fof}$ ,  $\text{gog}$ ,  $\text{foh}$ ,  $\text{hog}$ ,  $\text{hof}$ ,  $\text{fohog}$ ,  $\text{gofoh}$ ,  $\text{hogof}$
- 13 Define minimum spanning tree and explain Kruskal's algorithm with an example.
- 14 a) Explain diverse-remainder theorem with an example.  
b) Explain about Euler path and Euler circuit.
- 15 Find number of solutions  $e_1+e_2+e_3=17$   
a) Where  $e_1, e_2, e_3$  are non-negative integers with  $2 \leq e_1 \leq 5$ ,  $3 \leq e_2 \leq 6$ ,  $4 \leq e_3 \leq 7$   
b) Explain about monoid in detail with example.
- 16 Write short notes on  
a) Tree traversals  
b) Types of graph representations
- 17 a) Show that an undirected graph  $G = (V, E)$  has even number of vertices of odd degree.  
b) Solve the recurrence relation  $a_n = 6a_{n-1} - 9a_{n-2}$  for  $a_0 = 1$ ,  $a_1 = 6$ .

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**FACULTY OF ENGINEERING**  
**BE III - Semester (IT) (CBCS) (Backlog) Examination, July 2021**

**Subject: Discrete Mathematics**

**Time: 2 Hours**

**Max .Marks: 70**

**Note: Missing data, if any, may be suitably assumed**

**PART – A**

**Answer any five questions.**

**(5x2=10 Marks)**

- 1 What are the contrapositive, the converse and the inverse of the conditional statement “The home team wins whenever it is raining”?
- 2 Construct the truth table for  $(p \rightarrow q) \leftrightarrow (7q \rightarrow 7p)$
- 3 Define TAUTOLOGY with an example.
- 4 Use mathematical induction to prove that  $n^3 - n$  is divisible by ‘3’ whenever ‘n’ is a positive
- 5 Write universe of discourse property.
- 6 Solve the Recurrence relation  $a_n = 3a_{n-1} - 6a_{n-2}$
- 7 Use predicates, quantifiers, logical connectives and mathematical Operators to express the statement that there is a positive integer That is not the sum of three squares.
- 8 Define POSET with an example.
- 9 Show that  $n^2$  is not  $O(n)$
- 10 Define minimum spanning tree.

**PART – B**

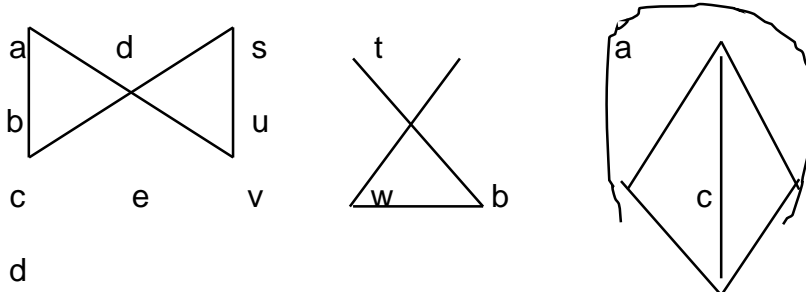
**Answer any four questions.**

**(4x15= 60 Marks)**

- 11 Construct a TRUTH TABLE of the following compound propositions.  
 $(a) p \oplus p$   $(b) p \oplus \sim p$   $(c) p \oplus \sim q$   
 $(d) \sim p \oplus \sim q$   $(e) (p \oplus q) \vee (p \oplus \sim q)$
- 12 (a) Define binomial theorem and find the coefficient  $a^{17}b^{23}$   
 In the expansion of  $(2a - 6b)^{40}$   
 (b) Use mathematical induction to show that  
 $1 + 2 + 2^2 + \dots + 2^n = 2^{n+1} - 1$   
 For all non – negative integer ‘n’
- 13 (a) For each real number x and y is it true that  
 $[x + y] = [x] + [y]$   
 (b) Show that  $f(x) = x^2 + 2x + 1$  is  $O(x^2)$

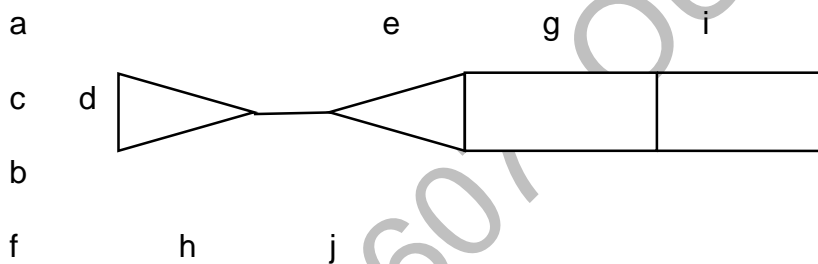
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- 14 (a) Draw the Hasse diagram for divisibility on the set  $\{1, 2, 3, 5, 7, 11, 13\}$ . Is it a Lattice?  
 (b) Define Euler circuit and Euler path. Find which of the following graph have Euler circuit or Euler path or not having both



- 15 (a) Solve  $a_n = a_{n-1}2n + 3, a_0 = 4$   
 (b) Find coefficient of  $x^9$  in  $(x^3 + x^5 + x^6)(x^3 + x^4)(x + x^2 + x^3 + \dots)$

- 16 (a) Use DFS algorithm to find spanning tree for the following graph



- (b) Describe Kruskal's algorithm for a minimal spanning tree with example.

- 17 (a) Among the first 100 positive integers. Find the integers which are not divisible by 5, 7, or 9.  
 (b) Find degree sequence of each of the following graph.  
 (i)  $K_4$  (ii)  $C_4$  (iii)  $W_4$  (iv)  $K_{2,3}$

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