D 123900 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 601—POWER SYSTEM ANALYSIS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

I. 1 Explain the need of base values.

2 A generator rated 25 MVA, 11 KV has a reactance of 15 %. Calculate its p.u. reactance for a base of 50 MVA and 10 KV.

3 Prepare the single phase equivalent circuit of three winding transformer.

4 Compare GSM and NRM with respect to number of iterations taken for convergence and memory requirement.

5 What is the need for slack bus in power flow analysis ?

6 Prepare the advantages and disadvantages of Gauss Seidal method.

7 What are the assumptions made in dynamic response of uncontrolled case ?

8 What is the necessity to regulate voltage and frequency in the power system ?

9 State the main objectives of Reactive power and Voltage control in power systems.

10 The Z bus method is very suitable for fault studies on large system infer ?

11 Demonstrate the zero sequence network diagram of a delta-delta connected transformer.

12 Why the neutral grounding impedance Zn appears as 3Zn in zero sequence equivalent circuit.

13 Point out equal area criterion.

Turn over

14 How to improve the transient stability limit of the power system.

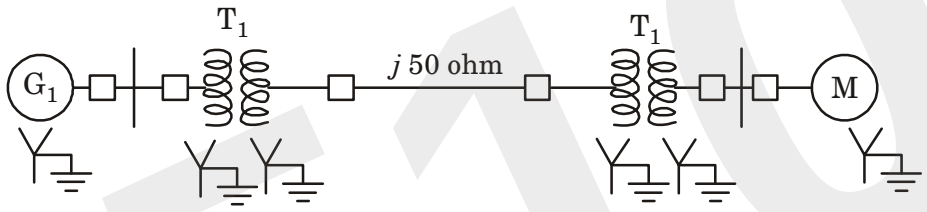
15 List the assumptions made in multi machine stability studies.

(10 × 5 = 50 marks)

Part B

Answer any **five** *questions.*

II. 1 Examine the reactance diagram for the power system shown in fig. Neglect resistance and use a base of 100 MVA, 220 kV in 50 Ω line. The ratings of the generator motor and transformer are given below :



Generator : 40 MVA, 25 KV, X" = 20 %.

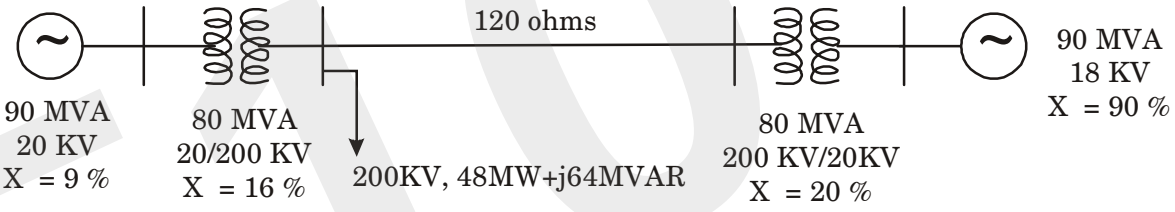
Synchronous Motor : 50 MVA, 11 KV, X" = 30 %

T_1 : Y – Y transformer : 40 MVA 33/220 KV, X = 15 %

T_2 : Y – Y transformer : 30 MVA 11/220 KV, X = 15 %

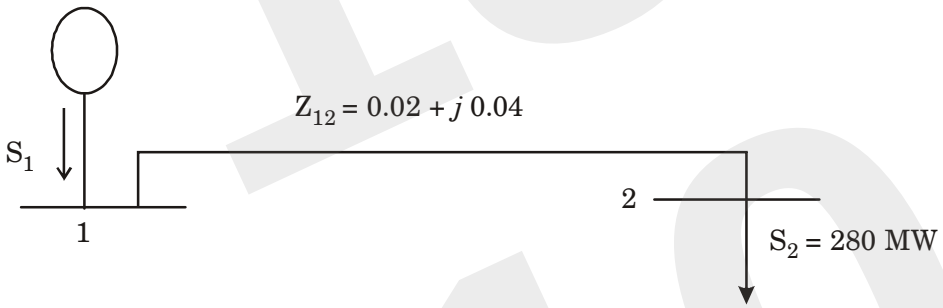
Or

2 Draw the p.u impedance diagram for the system shown in figure.



Choose Base MVA as 100 MVA and Base KV as 20 KV.

3 In the power system network shown in figure, bus 1 is slack bus with V1 = 1.0 + *j*0.0 per unit and bus 2 is a load bus with S2 = 280 MW = *j*60 MVAR. The line impedance on a base of 100 MVA is Z = 0.02 + *j* 0.04 per unit. Using Gauss - Seidal method, give V2. Use an initial estimate of V2 (0) = 1.0 + *j* 0.0 and perform four iterations. Also find S_1 and the real, reactive power loss in the line, assuming that the bus voltages have converged.



Or

4 Derive N-R method of load flow algorithm and explain the implementation of this algorithm with the flowchart.

5 The fuel inputs per hour of plants 1 and 2 are given as :

$F1 = 0.2P1^2 + 40P1 + 120$ Rs./hr.

$F2 = 0.25P2^2 + 30P2 + 150$ Rs./hr.

Calculate the economic operating schedule and the corresponding cost of generation. The maximum and the minimum loading on each unit are 100 MW and 25 MW. Assume the transmission losses are ignored and the total demand is 180 MW. Also determine the saving obtained if the load is equally shared by both the units.

Or

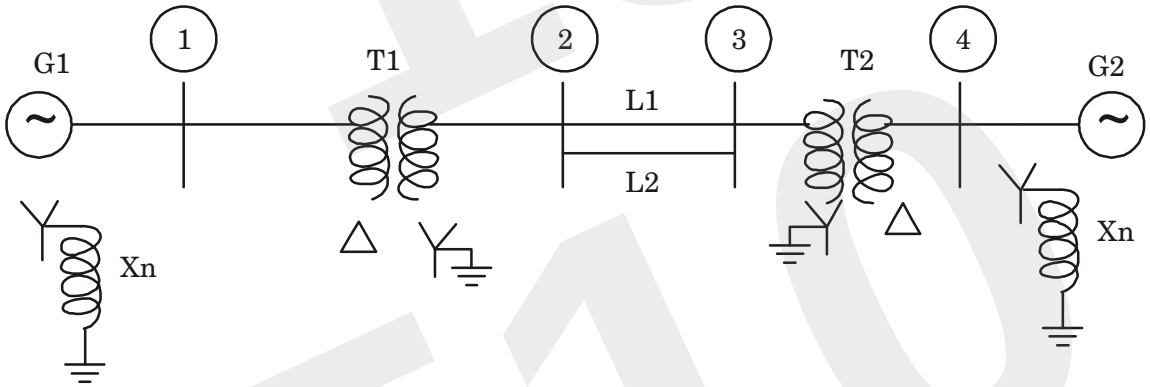
6 Draw the block diagram of uncontrolled two area load frequency control system and describe the salient features under static condition.

Turn over

7 A symmetrical fault occurs on bus 4 of system shown in figure ; examine the fault current, post fault voltages, line flows.

Generator G1, G2 :100 MVA, 20 KV, X1 = 15 %.

Transformer T1, T2 :, Xleak = 9 %, Transmission line L1, L2 : X1 = 10 %



Or

8. Point out the expression for fault current for a line to line fault taken place through impedance Zb in a power system.

9. Examine the swing equation of a synchronous machine swinging against an infinite bus. Clearly state the assumption in deducing the swing equation.

Or

10. Examine a short note on :

    (i) Factors influencing transient stability

    (ii) Voltage collapse.

(5 × 10 = 50 marks)

D 123906 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 601—CONTROL SYSTEM

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the following terms related to SFG - node, branch, transmittance.
2. List any *five* properties of signal flow graph.
3. Write the analogous electrical elements in torque- current analogy for elements of mechanical rotational systems.
4. Distinguish between type and order of system with examples.
5. Determine the type of damping in the system if the closed loop transfer function of a second order system is given by :

$$\frac{C(s)}{R(s)} = \frac{10}{s^2 + 6s + 10}$$

6. Explain the various static error constants.
7. What is a Nichol's chart ? List any *three* advantages.
8. Write a short note between correlation between time and frequency response.
9. Explain the terms resonance peaks and resonance frequency with equations.
10. Find the z transform of the function $f(k) = k^2$.
11. Explain sampled data control system with block diagram.
12. Write a short note on the process of sampling.

Turn over

13. List few advantages and disadvantages of state space analysis.

14. What is state transition matrix ? List its few properties.

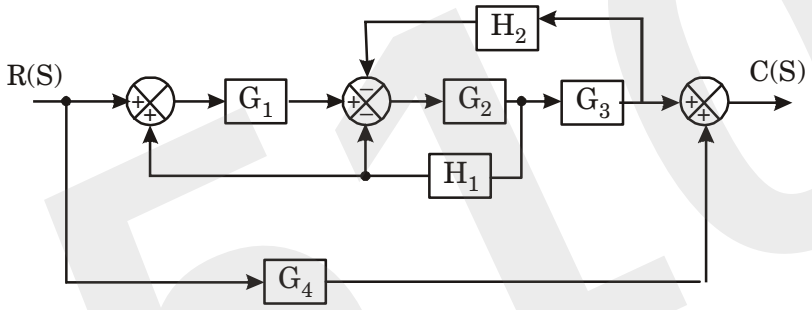
15. What are phase variables ? What are its advantages ?

(10 × 5 = 50 marks)

Part B

Answer any **one** *question from each module.*

16. By block reduction technique, obtain the transfer function of the figure given below :



Or

17. Obtain the transfer function of a field- controlled dc motor.

18. Draw the equivalent circuit of a P-controller implemented using inverting amplifier and perform its analysis to determine its gain Kp.

Or

19. Explain any *five* time domain specifications with necessary equations and graph.

20. How is gain margin and phase margin determined from Nichol's chart ? With an example explain how gain adjustment is done in Nichol's plot.

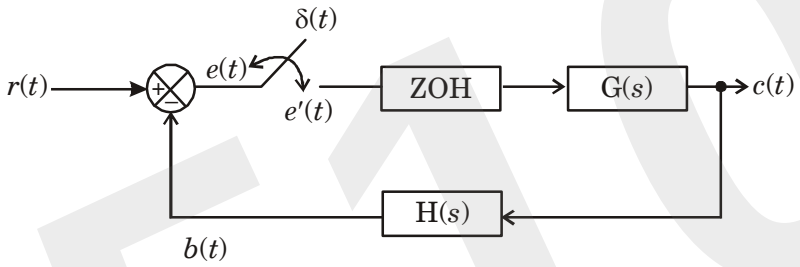
Or

21. Sketch bode plot for the following transfer function :

$$G(s) = \frac{75(1+0.2s)}{s(s^2+16s+100)}$$

22. Find C (z)/ R (z) for the following closed loop sampled data- controlled system. Assume all samplers to be of impulse type.

Assume $e(t)$ = error signal, $e'(t)$ = impulse sampled error signal, $b(t)$ = feedback signal.



Or

23. Check for stability of the sampled data-controlled system given whose characteristic equation given by $z^4 - 1.7z^3 + 1.04z^2 - 0.268z + 0.024 = 0$.

24. Compute e^{At} using any method if $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$.

Or

25. Obtain state model of system whose transfer function is given by :

$$\frac{Y(s)}{U(s)} = \frac{10}{s^3+4s^2+2s+1}.$$

(5 × 10 = 50 marks)

D 123912 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Information Technology

IT 19 601—COMPILER DESIGN

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the role of lexical analyzer.
2. Differentiate native compiler and cross compiler.
3. What is a regular expression ? State the rules which define regular expression.
4. Mention the properties of parse tree and syntax tree.
5. Construct parse tree for the string – (id + id) in the grammar E-> E + E | E*E |(E)| – E | id.
6. Explain the general strategies to recover from a syntactic error.
7. Enumerate the features of LR parsers.
8. Reduce the sentence abbcde to S for the given grammar

   $S \rightarrow aABe$

   $A \rightarrow Abc \mid b$

   $B \rightarrow d$
9. Enumerate the four actions performed by shift-reduce parsers.
10. Draw the DAG for the expression a = (a * b + c) – (a * b + c).
11. What do you mean by S-attributed and L-attributed syntax directed translation ?
12. List the types of static checks of a compiler.

Turn over

13. Depict diagrammatically the organization of code optimizer.

14. Explain the techniques of loop optimization.

15. Write code sequence for d : = (a – b) + (a – c) + (a – c)

(10 × 5 = 50 marks)

Part B

Answer **one full** *section from each question.*

Each question carries 10 *marks.*

16. (a) Explain various phases of a compiler with diagram.

Or

(b) State the algebraic properties of regular expressions and list the operations on languages. Also draw transition diagram for identifiers.

17. (a) Illustrate the steps involved in the construction of predictive parsing table for the given grammar on input id + id * id.

$E \rightarrow E + T \mid T \qquad T \rightarrow T^*F \mid F \qquad F \rightarrow (E) \mid id.$

Or

(b) Explain the algorithm to construct LL(1) parsing table with an example.

18. (a) Consider the string "10201", design a shift-reduce parser for the following grammar- $S \rightarrow 0S0 \mid 1S1 \mid 2$.

Or

(b) Discuss the features of SLR, Canonical LR and LALR parsers and compare the performance of SLR, Canonical LR and LALR parsing techniques.

19. (a) List and explain dynamic storage allocation techniques in detail.

Or

(b) Explain the specifications of a simple type checker.

20. (a) What is local and global transformation ? Discuss in detail the techniques of function preserving transformations.

Or

(b) Discuss the issues in the design of a code generator in detail.

(5 × 10 = 50 marks)

D 123912 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Information Technology

IT 19 601—COMPILER DESIGN

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the role of lexical analyzer.
2. Differentiate native compiler and cross compiler.
3. What is a regular expression ? State the rules which define regular expression.
4. Mention the properties of parse tree and syntax tree.
5. Construct parse tree for the string – (id + id) in the grammar E-> E + E | E*E |(E)| – E | id.
6. Explain the general strategies to recover from a syntactic error.
7. Enumerate the features of LR parsers.
8. Reduce the sentence abbcde to S for the given grammar

   $S \rightarrow aABe$

   $A \rightarrow Abc \mid b$

   $B \rightarrow d$
9. Enumerate the four actions performed by shift-reduce parsers.
10. Draw the DAG for the expression a = (a * b + c) – (a * b + c).
11. What do you mean by S-attributed and L-attributed syntax directed translation ?
12. List the types of static checks of a compiler.

Turn over

13. Depict diagrammatically the organization of code optimizer.

14. Explain the techniques of loop optimization.

15. Write code sequence for d : = (a – b) + (a – c) + (a – c)

(10 × 5 = 50 marks)

Part B

Answer **one full** *section from each question.*

Each question carries 10 *marks.*

16. (a) Explain various phases of a compiler with diagram.

Or

(b) State the algebraic properties of regular expressions and list the operations on languages. Also draw transition diagram for identifiers.

17. (a) Illustrate the steps involved in the construction of predictive parsing table for the given grammar on input id + id * id.

$E \rightarrow E + T \mid T \qquad T \rightarrow T^*F \mid F \qquad F \rightarrow (E) \mid id.$

Or

(b) Explain the algorithm to construct LL(1) parsing table with an example.

18. (a) Consider the string "10201", design a shift-reduce parser for the following grammar- $S \rightarrow 0S0 \mid 1S1 \mid 2$.

Or

(b) Discuss the features of SLR, Canonical LR and LALR parsers and compare the performance of SLR, Canonical LR and LALR parsing techniques.

19. (a) List and explain dynamic storage allocation techniques in detail.

Or

(b) Explain the specifications of a simple type checker.

20. (a) What is local and global transformation ? Discuss in detail the techniques of function preserving transformations.

Or

(b) Discuss the issues in the design of a code generator in detail.

(5 × 10 = 50 marks)

D 123920 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 601—THERMAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Compare Otto, Diesel and Dual combustion cycles.
2. Derive an expression for air standard efficiency of an Otto cycle citing all assumptions involved
3. Explain turbo-charging in IC engines and list any 4 advantages over naturally aspirated engines.
4. State four desirable properties of an CI engine fuel
5. Explain flash point, fire point and calorific value of fuels.
6. Describe Morse test. What are the assumptions made in this test ?
7. Explain the stages of combustion in CI Engine
8. Write a short note about the pollutants from SI and CI engine.
9. Write a short note on alternate fuels for IC engine.
10. List one advantage and one disadvantage of the reheat cycle and regenerative cycle.
11. What are the merits and demerits of gas turbine over internal combustion engine ?
12. With the aid of a diagram, explain any one combustion chamber for gas turbines.
13. Derive the expression for critical pressure ratio of flow of steam through nozzle.

Turn over

14. Define the terms : (i) Degree of reaction ; (ii) Stage efficiency ; and (iii) Reheat factor.

15. Explain the metastable flow in a nozzle with h-s diagram.

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each Section.*
Each question carries 10 *marks.*

16. (a) With neat sketches explain the construction and working of wankel engine.

Or

(b) An engine working on ideal Otto cycle has a temperature of 300 K at the beginning of compression. If the ideal air standard efficiency is 50 %, calculate the compression ratio of the engine. If the peak temperature of the cycle is 1150 K, calculate the heat supplied and net work output of the cycle per kg of air.

17. (a) A test on a two-stroke engine gave the following results at full load.

Speed = 350 r.p.m.; Net brake load : 65 kg; mean effective pressure = 3 bar; Fuel consumption 4 kg/h; Jacket cooling water flow rate = 500 kg/h; jacket water temperature at inlet = 20°C; jacket water temperature at outlet = 40°C; Test room temperature = 20°C; Temperature of exhaust gases = 400°C; Air used per kg of fuel = 32 kg ; cylinder diameter = 22 cm ; stroke = 28 cm ; effective brake diameter = I m ; calorific value of fuel = 43 MJ/kg ; Mean specific heat of exhaust gases = 1 kJ/kg-K. Find indicated power, brake power and draw up a heat balance for the test in kw and in percentage.

Or

(b) (i) Describe Retardation test and its application. (4 marks)

(ii) Derive an expression for the efficiency of the air standard Diesel cycle in terms of the cycle compression ratio and cut-off ratio.

(6 marks)

18. (a) Define Swirl, Tumble and Squish. Explain how various types of CI engine combustion chamber is designed to produce swirl, with suitable diagrams.

Or

(b) (i) What are the stages of combustion in a SI engine ? Explain with the support of pressure vs crank angle diagram.

(5 marks)

(ii) Define highest useful compression ratio (HUCR) and Octane Number for an SI engine fuel. How it is evaluated ?

(5 marks)

19. (a) A four stage steam turbine receives steam at 35 bar and 435°C and exhausts at 0.04 bar. Each stage has same efficiency ratio of 0.76. If the pressure at the end of stages are 5, 1.2 and 0.25 bar respectively, determine : (i) Rankine enthalpy drop : (ii) Work done ; and (iii) Reheat factor.

Or

(b) Steam at a pressure of 15 bar and 250°C is expanded through a turbine to a pressure of 4 bar. It is then reheated at constant pressure to 250°C and finally expanded to 0.1 bar. Find out the efficiency of this cycle. What will be the efficiency without reheating ? Pump work can be neglected.

20. (a) With the help of a figure explain the working of a Velox boiler and mention its merits and demerits over other high pressure boilers.

Or

(b) Explain why safety valves are needed in a boiler. Make a neat sketch of spring loaded safety valve and explain its working.

(5 × 10 = 50 marks)

D 123926 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 601—SCREEN PRINTING AND GRAVURE

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. What are the different types of knife cut stencils used in screen printing ? Brief.
2. Explain the process of screen reclamation for its reuse.
3. How does the screen printing is different from other printing processes ? Describe.
4. What are the two print head designs of flatbed screen printing presses ? Explain.
5. Classify and explain the screen printing presses according to the amount of automation provided.
6. What is container press ? Describe.
7. What are the gravure cylinder imbalances ? and how to correct them ? Discuss.
8. Write an account of product gravure.
9. Explain color balance etches and spot plating.
10. How do doctor blade distance from Nip, its edge and mounting effect the quality of print ? Brief.
11. Write a short note on balancing impression roller on gravure presses.
12. What are the different materials used for gravure doctor blade ? Describe.
13. Draw a generic gravure printing unit and explain the components.

Turn over

14. Why is the ink transfer in gravure printing difficult on substrates with surface irregularities ?

15. Explain the factors that influence ink transfer on gravure presses.

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each section.*

Each question carries 10 *marks.*

16. (a) Explain the step by step procedure of making capillary stencils with simple diagrams for each stage.

Or

(b) Describe the method of screen reclamation and the procedure to clean the clogged screen.

17. (a) Explain with neat diagram, the working principle of rotary screen printing machine. List its advantages and disadvantages.

Or

(b) Discuss the principles of carousel and oval screen printing machines used for textiles.

18. (a) Explain the stages of making gravure cylinder using laser ablation and chemical etching process.

Or

(b) Describe the well formation in gravure cylinder making process. What are the different cell structures that can be formed by different imaging techniques ? Discuss.

19. (a) Explain the gravure impression roller design and construction with neat diagram.

Or

(b) Write an essay on storage of gravure impression rollers.

20. (a) With neat diagram, explain the top side and bottom side gravure presses. List advantages and disadvantages.

Or

(b) Describe the following presses with neat diagrams : offset gravure press, Flexo - gravure and Gravure with flexo units.

(5 × 10 = 50 marks)

D 123901 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 602—MODERN CONTROL THEORY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1 Define the following :

i) Eigen values ;

ii) Eigen vectors ; and

ii) State of a system.

2 Derive the solution of Non-homogenous state equations

3 Construct the state model for a system characterized by the differential equation,

$$\frac{d^3y}{dt^3} + 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} + 6y + u = 0.$$

4 Construct phase trajectory for the system described by the equation.

$$\frac{dx_2}{dx_1} = \frac{4x_1 + 3x_2}{x_1 + x_2}.$$

Comment on the stability of the system

5 Explain the following non-linearties :

i) Saturation ; and

ii) Dead-zone.

6 Briefly explain the concept of equilibrium points and the stability definitions.

Turn over

7 Define Lyapunov's sufficient condition for asymptotic stability.

8 Summarize the positive-finiteness of scalar functions. Give an example ?

9 Mention the advantages of Lyapunov's stability criteria.

10 What is the state observer ? Draw the diagram for State Observer and point out main features.

11 Explain with an example the concept of controllability in continuous time invariant systems

12 Examine the controllability and observability of the system given below.

$$\begin{bmatrix}\dot{x}_1\\ \dot{x}_2\\ \dot{x}_3\end{bmatrix} = \begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix} X + \begin{bmatrix}0\\ 0\\ 1\end{bmatrix} u$$

$$y = \begin{bmatrix}10 & 5 & 1\end{bmatrix} x.$$

13 State and explain the principle of optimality.

14 Explain the main obj ective of optimal control.

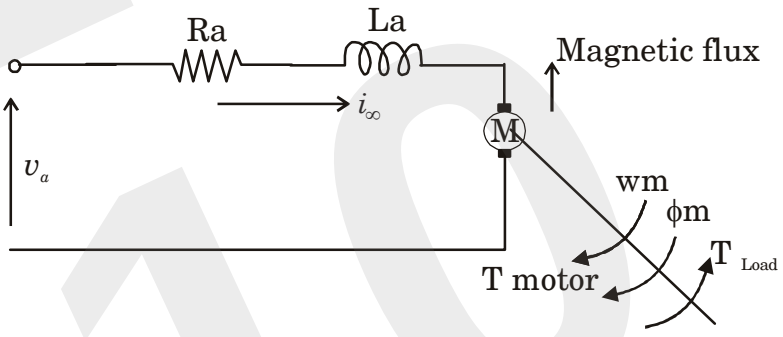
15 How to linearize the cost function around the optimal solution?

(10 × 5 = 50 marks)

Part B

Answer any **five** *questions.*

1 Consider the system shown for the d.c. motor



Obtain the state space model.

Or

2 A linear time invariant system is described by the following state model

$$\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\\ \dot{X}_3\end{bmatrix}=\begin{bmatrix}0 & 1 & 0\\ 0 & 0 & 1\\ -6 & -11 & -6\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}+\begin{bmatrix}0\\ 0\\ 2\end{bmatrix}u$$

$$Y=\begin{bmatrix}1 & 0 & 0\end{bmatrix}\begin{bmatrix}X_1\\ X_2\\ X_3\end{bmatrix}.$$

Compute the state transition matrix e^{At} using similarity transformation method.

3 Explain how phase plane trajectory using method of isoclines can be constructed for the system described by

$$\frac{d^2x}{dt^2}+\frac{dx}{dt}+x(t)=0.$$

Or

4 Explain how an element with dead-zone can be analyzed using describing function method

5 Consider the system described by the state model,

$$\dot{x}=Ax \qquad \text{where } A=\begin{bmatrix}-1 & 1\\ 1 & -2\end{bmatrix} \text{ and } C=\begin{bmatrix}1 & 0\end{bmatrix}$$

$$y=Cx$$

Design a full order state observer. The desired Eigen values for the observer matrix are $\mu_1=-5$ and $\mu_2=-5$.

Or

6 Explain the observable canonical form for an example.

7 Using direct method of Liapunov, determine the stability of the system given by,

$$x(t)=Ax(t) \text{ where } A=\begin{bmatrix}-1 & -2\\ 1 & -4\end{bmatrix}.$$

Or

8 Summarize Krasovskii method and how it can be applicable for stability analysis explain with an example for it.

9 Derive equation for Quadratic Performance Index with Linear Constraint.

Ort

10 Discuss about the plant and the quadratic performance index with particular reference to physical significance.

(5 × 10 = 50 marks)

D 123913 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 602—COMPUTER NETWORKS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain static and dynamic broadcast networks.
2. Differentiate connection-oriented and connectionless services.
3. Write short notes on pure ALOHA and slotted ALOHA.
4. Explain the significance of network layer.
5. Tabulate the differences between datagram and virtual subnets.
6. State and explain optimality principle with diagram.
7. Explicate the role of address resolution protocol in mapping of IP address onto Ethernet address.
8. Mention the disadvantages of Reverse Address Resolution Protocol.
9. Explain the categories of ICMP messages.
10. Specify the socket primitives used in Berkeley UNIX for TCP.
11. Illustrate the method of establishing a connection using three-way handshake.
12. State the key features of TCP.
13. Explain the format of resource record in DNS with an example.
14. Expand MIME and define the five message headers of MIME in Electronic mail.
15. What is an URL ? Mention the parts of an URL.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. a) Discuss the uses of computer networks.

Or

b) Explain the method of CSMA with collision detection with diagram.

17. a) Explicate the method of distance vector routing with diagram.

Or

b) Illustrate the concept of Dijikstra's shortest path routing with an example.

18. a) Describe the working of Open Shortest Path First (OSPF) protocol with diagram.

Or

b) Explain in detail about ICMPv6.

19. a) Illustrate four protocol scenarios for releasing a connection with diagram.

Or

b) Explain the way of handling congestion control by TCP in detail.

20. a) Explain the five basic functions supported by E-mail systems and discuss the significance of POP3 on E-mail systems.

Or

b) Explain H.323 architectural model for Internet telephony and give the structure of H.323 protocol stack.

(5 × 10 = 50 marks)

D 123907 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 602—VLSI DESIGN

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain the body effect in transistor.
2. Explain the subthreshold conduction.
3. What is charge sharing ?
4. Design a full adder.
5. Discuss the operation of single ended sense amplifier.
6. Explain the working of 6T SRAM cell.
7. Define and explain Flick's law.
8. What is modulation transfer function ?
9. What is a contrast curve ? Give its significance in VLSI fabrication.
10. What do you mean by oxide isolation ?
11. Explain implanted ohmic contacts.
12. Explain LOCOS process.
13. What are the steps involved in twin-tub process ?
14. Draw the circuit schematic and stick diagram of CMOS 2 input NOR gate.
15. What is Stick Diagram ? What are its uses ?

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *question from each module.*

16. Explain the short and narrow channel effects in MOS transistor.

Or

17. Analyse the working of MOS inverters with resistive load.

18. Explain the working of array multiplier.

Or

19. Explain the working of square root carry select adder.

20. Clearly explain about ion implantation steps in IC fabrication.

Or

21. Define Diffusion. Explain the different types of diffusion processes.

22. Explain the SILO and SWAMI processes in detail.

Or

23. Explain in detail about contacts and metallisation.

24. Illustrate the lambda-based layout and design rules with neat sketches.

Or

25. Explain the steps involved in the p-well process of CMOS fabrication with neat sketches.

(5 × 10 = 50 marks)

D 123921 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 602—MACHINE DESIGN I

Time : Three Hours Maximum : 100 Marks

Each question carries 20 *marks.*

1. (a) (i) Explain unilateral and bilateral tolerances. Give examples. (5 marks)

(ii) Stresses induced at a critical point in a machine component made of steel 45C8 are as follows, $\sigma_x = 100$ MPa, $\sigma_y = 50$ MPa, and $\tau_{xy} = 75$ MPa. Calculate the factor of safety by :

(i) Maximum normal stress theory.

(ii) Maximum shear stress theory.

(iii) Distortion energy theory.

Take yield strength for 45C8 = 380 MPa

(15 marks)

Or

(b) (i) Discuss the factors affecting endurance limit. (5 marks)

(ii) A bolt is subjected to an axial pull of 8 kN and a transverse shear force of 3 kN. Determine the diameter of the bolt required based on :

(i) Maximum principal stress theory.

(ii) Maximum shear stress theory.

Take elastic limit in simple tension is equal to 270 MPa and Poisson's ratio = 0.3. Assume factor of safety as 3.

(15 marks)

Turn over

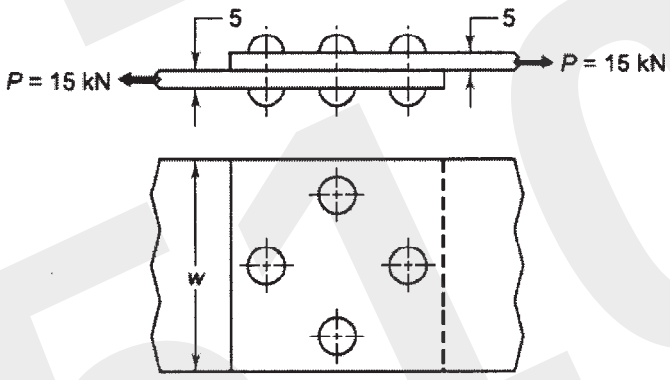
2. (a) Two plates, each 5 mm. thick, are connected by means of four rivets as shown in Fig. The permissible stresses for rivets and plates in tension, shear and compression are 80, 60 and 120 N/mm^2 respectively.

Calculate :

(i) Diameter of the rivets.

(ii) Width of the plate.

(iii) Efficiency of the joint.



Or

(b) A cylindrical pressure vessel with 1 m. inner diameter is subjected to internal steam pressure of 1.5 MPa. The permissible stresses for the cylinder plate and the rivets in tension, shear and compression are 80, 60 and 120 N/mm^2 respectively. The efficiency of longitudinal joint can be taken as 80 % for the purpose of calculating the plate thickness. The efficiency of circumferential lap joint should be at least 62 %. Design the circumferential lap joint and calculate :

(i) Thickness of the plate ;

(ii) Diameter of the rivets ;

(iii) Number of rivets ;

(iv) Pitch of rivets ;

(v) Number of rows of rivets; and

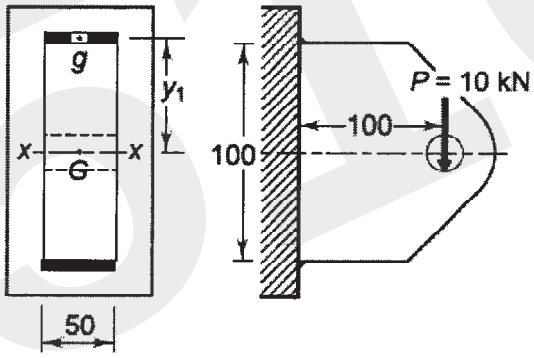
(vi) Overlap of the plates.

3. (a) The cylinder head of a steam engine is subjected to a steam pressure of 0.7 N/mm^2. It is held in position by means of 12 bolts. A soft copper gasket is used to make the joint leak-proof. The effective diameter of cylinder is 300 mm. Find the size of the bolts so that the stress in the bolts is not to exceed 100 MPa.

Or

(b) A cast iron cylinder head is fastened to a cylinder of 500 mm. bore with 8 stud bolts. The maximum pressure inside the cylinder is 2 MPa. The stiffness of part is thrice the stiffness of the bolt. What should be the initial tightening load so that the point is leak proof at maximum pressure ? Also choose a suitable bolt for the above application.

4. (a) A bracket is welded to the vertical column by means of two fillet welds as shown in Fig. Determine the size of the welds, if the permissible shear stress in the weld is limited to 70 N/mm^2.

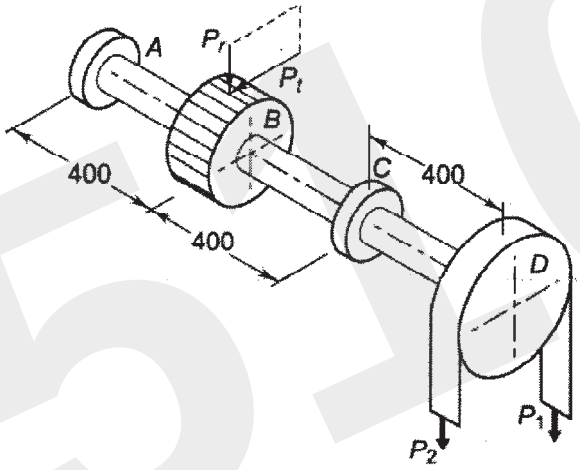


Or

(b) A safety valve 40 mm. in diameter is to blow-off at a pressure of 1.2 MPa. It is held on its seat by means of a helical compression spring, with initial compression of 20 mm. The maximum lift of the valve is 12 mm. The spring index is 6. The spring is made of cold-drawn steel wire with ultimate tensile strength of 1400 N/mm^2. The permissible shear stress can be taken as 50 % of this strength. Design the spring. Take modulus of rigidity, G = 81370 N/mm^2.

Turn over

5. (a) A transmission shaft supporting a spur gear B and the pulley D is shown in Fig. The shaft is mounted on two bearings A and C. The diameter of the pulley and the pitch circle diameter of the gear are 450 mm. and 300 mm. respectively. The pulley transmits 20 kW power at 500 r.p.m. to the gear. P_1 and P_2 are belt tensions in the tight and loose sides, while Pt and Pr are tangential and radial components of gear tooth force. Assume, $P_1 = 3P_2$ and Pr = Pt tan (20°). The gear and pulley are keyed to the shaft. The material of the shaft is steel 50C4 (S_{ut} = 700 and S_{yt} = 460 N/mm^2). The factors k_b and k_t of the ASME code are 1.5 each. Determine the shaft diameter using the ASME code.



All dimensions are in mm

Or

(b) A rigid type of coupling is used to connect two shafts transmitting 15 kW at 200 r.p.m. The shaft, keys and bolts are made of C45 steel and the coupling of is of cast iron. Design the coupling.

[5 × 20 = 100 marks]

D 123927 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 602—POST PRODUCTION TECHNOLOGY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. How do you deal with fungi and pests while storing the paper ? Discuss.
2. Discuss the lining materials used for book binding.
3. Write a note on use and care of all types of materials used in binding.
4. What is radiation curing and ultra-curing ? Explain.
5. Write a note on latex adhesives, its benefits and drawbacks.
6. With an example explain the adhesives that cure when heated.
7. Write short notes on maintenance of guillotines.
8. Discuss the production capacities of different trimmers.
9. What are the ways in which 2-up books can be trimmed ? Explain.
10. Describe the maintenance of machine feeders.
11. Describe French and fan folds.
12. Explain upright delivery unit with neat diagram.
13. Differentiate between side sewing and saddle sewing.

Turn over

14. Explain gathering and collating.

15. Explain the process of lamination.

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each section.*

Each question carries 10 *marks.*

16. (a) What are the different types of papers used in binding ? Explain with their properties.

Or

(b) List all tools used in bindery and describe with their purpose of use.

17. (a) What are the different types of hot melt adhesives used in binding? Explain each with their applications

Or

(b) Explain the following adhesives with properties : Polyurethanes, polyvinyl acetate, poly vinyl alcohol, poly-vinylidene chloride and SIS block copolymers

18. (a) With neat diagram explain the principle and components of single knife guillotine cutting machine.

Or

(b) Compare three knife trimmers with five knife trimmers in terms of their usage, principle, merits, demerits and applications.

19. (a) What are the different types are feeding units used for folding machines ? Describe each of them.

Or

(b) Describe the feeding and folding rollers used on folding machines. What are the different surface finishing used for these rollers ? Discuss.

20. (a) What do you mean by attachment of plates in book binding ? Explain the different ways in attaching the plates to the book sections.

Or

(b) Explain the different methods of mechanical binding with applications.

(5 × 10 = 50 marks)

D 123902 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 603—POWER ELECTRONICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

I. 1 Identify the advantages of 'RC' triggering over 'R' triggering.

2 Illustrate the need of snubber circuit.

3 Mention the merits and demerits of GTO.

4 A two pulse converter is fed with a 230 V, 50 Hz supply. The load on the converter is a pure resistance of R = 10 Ω. Obtain the average output voltage for a firing angle of α =135°

5 Predict the circuits turn -off time for single phase full converter.

6 Examine is the cause of circulating current in dual converters.

7 Why thyristors are not preferred for Inverter ?

8 State the advantages of PWM control in inverter.

9 Write about voltage control with neat diagram.

10 Differentiate phase control and sequence control of voltage controller

11 Write about step up cyclo converter.

12 Explain an application of AC to AC controller.

13 Define DC Chopper and write down the application of DC chopper.

Turn over

14 Briefly state the working of four quadrant DC chopper.

15 A step up chopper is operated with a duty ratio of 0.6 for a dc input of 100 V. Determine the output voltage for a load resistance of 5 ohm.

(10 × 5 = 50 marks)

Part B

Answer any **five** *questions.*

II. 1 Explain the steady state and switching characteristics of MOSFET with aid of diagrams.

Or

2 Explain the principle of operation and characteristics of GTO.

3 Discuss the effect of inductance on the performance of the single phase full converter indicating clearly the conduction of various thyristors during one cycle.

Or

4 Describe the operation of three phase semiconverter with R load and also draw the output voltage waveforms.

5 Describe the principle of operation of 3 phase voltage source inverter with 180°conduction mode with necessary waveforms and circuits.

Or

6 State the different methods of voltage control inverters. Describe about PWM control in inverter.

7 Describe the operating principle of single phase to single phase step down cycloconverter with continuous and discontinuous load current waveform.

Or

8 Draw and Describe the circuit diagram of single phase AC voltage controller with RL load. Explain the circuit operation with necessary waveforms.

9 (i) Explain the control strategies of chopper with neat diagrams.

(ii) Explain an application of DC to DC Converter.

Or

10 Draw the power circuit diagram of a buck regulator and explain its operation with equivalent circuit for different modes and waveforms.

(5 × 10 = 50 marks)

D 123908 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 603—DATA COMMUNICATION AND NETWORKING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Summarize the concept of packet switching.
2. List the features and applications of networking layer.
3. Differentiate synchronous and asynchronous communication.
4. Compare and contrast guided and unguided transmission medium.
5. Discuss any one method used for error control during data transmission with example.
6. Describe the X.25 protocol.
7. Write short note on ICMP.
8. What is meant by SMTP ?
9. In the context of networking devices, explain the term hub.
10. What is meant by service time characterization ?
11. What is blocking probability ? How do you calculate it ?
12. Explain M/G/1 queue with diagram.
13. Explain the TLS protocol.
14. Describe how security at application layer is ensured.
15. Write short note on DMZ network.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *question from each module.*

16. Differentiate between serial and parallel communication.

Or

17. Explain the various layers in OSI model.

18. Describe CSMA/CD with necessary figures.

Or

19. What is ATM network ? How is routing done in ATM networks ?

20. How is routing classified ? Explain any *one* routing algorithm.

Or

21. Compare and contrast between IPv4 and IPv6.

22. In detail explain about Poisson process M/M/1 model.

Or

23. Explain in detail about Continuous time and discrete time Markov chains.

24. Explain firewall and its types. List few limitations of firewalls.

Or

25. Explain in detail on Hybrid Intrusion Detection System.

(5 × 10 = 50 marks)

D 123914 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 603—MICROPROCESSORS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Enumerate the features and functions of a microprocessor.
2. Tabulate the differences between procedures and macros.
3. Write an assembly language program for calculating the factorial of a number using 8086 microprocessor.
4. Depict the encoding of status lines indications.
5. List the tasks that are performed when 8086 microprocessor encounters an interrupt.
6. State and explain the types of hardware interrupts.
7. Specify the need for memory management in microprocessors.
8. Draw the schematic diagram of interfacing memory chips and I/O devices to a microprocessor.
9. Explain the procedure of interfacing static memory interfacing with 8086.
10. Elaborate the working of 8279 programmable keyboard.
11. Draw the block diagram of 8259 programmable interrupt controller.
12. Enumerate the applications of 8254 programmable interval timer.
13. Explain any three ARM instructions in detail.
14. Give the salient features of RISC architectures.
15. Summarize the trade-off between RISC and CISC machines.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. a) Illustrate the architecture of 8086 microprocessor with a neat diagram.

Or

b) Write an assembly language program for 8086 to add the contents of the memory location 2000H:0500H to contents of 3000H:0600H and store the result in 5000H:0700H with detailed procedure and flow chart.

17. a) Explain the functions of pins and signals in 8086 microprocessor.

Or

b) What are software interrupts ? Explain the types of software interrupts in detail.

18. a) Design an interface between 8086 CPU and two chips of 16Kx8 EPROM and 32Kx8 RAM. The RAM address must start at 00000 H.

Or

b) Illustrate the types of address decoding techniques with diagram.

19. a) Draw the block diagram and explain the operations of 8255 Parallel communication interface.

Or

b) Discuss the features of programmable timer and explain its different modes of operation.

20. a) Explain the architecture of ARM microprocessor with block diagram.

Or

b) Discuss different types of addressing modes in ARM processor.

(5 × 10 = 50 marks)

D 123922 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 603—DYNAMICS OF MACHINERY

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. State the principle of virtual work and illustrate with simple sketch.
2. Specify any *three* characteristics and two applications of bevel gears.
3. What are the conditions for the static equilibrium of four force planar member ?
4. State the D'Alembert's principle with numerical illustrations.
5. Draw the free-body diagram of a slider in a slider crank mechanism and specify all the static and dynamic forces acting in it.
6. Define the term 'offset circle' in dynamic force analysis and specify the use of offset circle.
7. Compare the size flywheel required for single cylinder internal combustion engine and mechanically operated punching press.
8. "V and radial engines do not require a couple balancing'—Justify.
9. State the effect of centrifugal force on the stability of four wheeler automobile.
10. Differentiate the free vibrations and forced vibrations. Give *two* example for each.
11. Write the equation of motion of single degrees of freedom torsional vibration with a free-body diagram.
12. Draw the graph between the transmissibility and the frequency ratio, specify any two important observations.

Turn over

13. State the significance of polar moment of inertia of a shaft in torsional vibrations.

14. Write the Dunkerley's relation for the critical speed of a shaft and specify the significance of each term in it.

15. Write short notes on dynamic vibration absorbers.

(10 × 5 = 50 marks)

Part B

Each question carries 10 *marks.*

16. A four bar linkage with the following dimensions is acted upon by a force of 50 N on the link DC as shown in Fig. 1. AD = 300 mm, AB = 400 mm, BC = 600 mm, DC = 640 mm, DE = 840 mm. Determine the input torque T on the link AB for the static equilibrium of the mechanism for the given configuration.

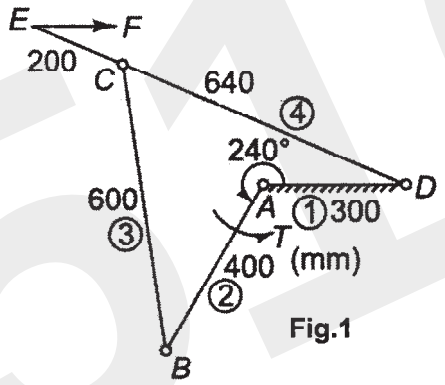


Fig.1

Or

17. A slider crank mechanism is subjected to two forces as shown in Fig. 2. The dimensions of various links are AB = 250 mm, BC = 600 mm, BD = 250 mm. and θ = 45°. Determine the drive torque, T_2 required on link, AB. Also, find the joint reactions.

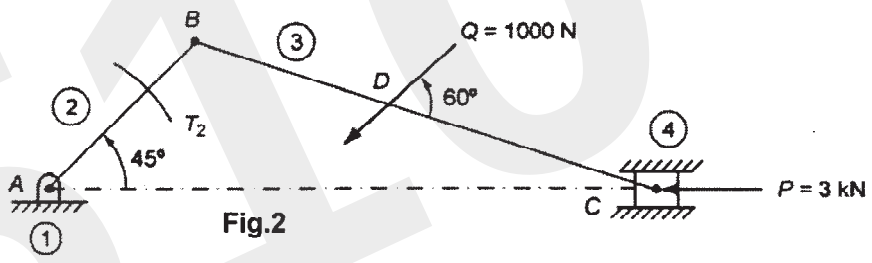


Fig.2

18. In a double acting vertical steam engine running at 360 r.p.m, cylinder diameter is 250 mm., stroke is 300 mm, diameter of the piston is 37.5 mm. and the length of connecting rod is 600 mm. When the crank is moved at 120° from top dead centre, the pressure of steam at cover end is 0.35 MPa and at crank is 0.03 MPa. If the mass of the reciprocating parts is 45 kg, find the piston effort and the turning moment on the crank shaft for the given crank position. Use analytical approach.

Or

19. The following data relate to a horizontal reciprocating engine as shown in Fig. 3 mass of reciprocating parts =120 kg, crank length = 90 mm, engine speed = 600 r.p.m, connecting rod length = 450 mm, mass of connecting rod = 90 kg, distance of centre of mass from big end = 180 mm, radius of gyration of connecting rod = 150 mm. Find the magnitude and the direction of troque required on crank for the dynamic equilibrium of the mechanism, if, $\theta = 30°$. Given that, $A_b = 343$ m/s^2 at 0° from first quadrant, $A_g = 345$ m/s^2 at 150° counter clockwise from first quadrant and $\alpha_3 = 385$ rad/s^2 CW. The crank, OA is balanced crank. Use graphical approach.

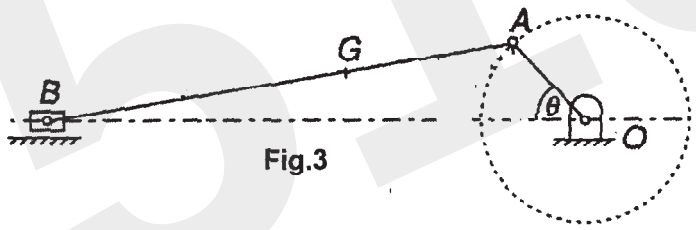


Fig.3

20. The axes of a three-cylinder air compressor are at 120° to one another and their connecting rods are coupled to a single crank. The length of each connecting rod is 240 mm. and the stroke is 160 mm. The reciprocating parts have a mass of 2.4 kg. per cylinder. Determine the primary and secondary forces, if the engine runs at 2000 r.p.m.

Or

21. A single cylinder, single acting, four stroke gas engine develops 20 kW at 200 r.p.m. The work done by the gasses during the expansion stroke is 3 times the work done on the gasses during the compression stroke. The work done during the suction and the exhaust stroke may be neglected. If the flywheel has a mass of 1000 kg. and has a radius of gyration of 0.6 m, find the fluctuation of energy and the co-efficient of fluctuation of speed.

Turn over

22. A mass of 5 kg. hangs from a spring and makes damped oscillations. If the time of 50 complete oscillations is found to be 20 s, and the ratio of the first downward displacement to the sixth is found to be 22.5, find the stiffness of the spring and the damping co-efficient.

Or

23. A mass of 250 N is supported by a spring and dashpot. The spring is stretched by 150 mm. due to weight and the dashpot has co-efficient of damping 1 kN/m/s. If the support oscillation is simple harmonic motion with amplitude 25 mm. and frequency of 6 rad/s. Find, the amplitude of load, the relative amplitude between load and support, and the amplitude of the load at resonance.

24. A machine part having a mass of 2.5 kg. vibrates in a viscus medium. A harmonic exciting force of 30 N acts on the part and causes a resonant amplitude of 14 mm. with a period of 0.22 s. Find the damping co-efficient. If the frequency of the exciting force is changed to 4 Hz, determine the increase in the amplitude of the forced vibrations upon the removal of the damper.

Or

25. The shaft shown in Fig. 4. carries two masses. The mass A is 300 kg. with a radius of gyration of 0.75 m. and the mass B is 500 kg. with a radius of gyration of 0.9 m. Determine the natural frequency of torsional oscillations. It is desired to have the node at the midsection of the shaft of 120 mm. diameter by changing the diameter of the section having 90 mm. What will be the new diameter ? Take, G = 84 GPa.

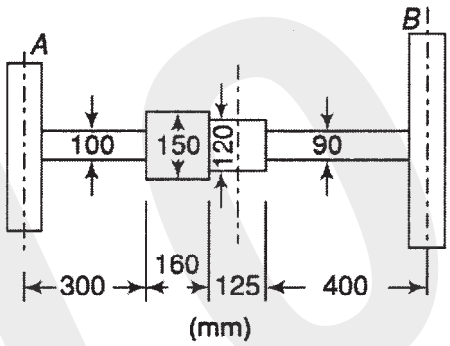


Fig.4

(5 × 10 = 50 marks)

D 123928 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 603—DIGITAL PRINTING AND PRE-PRESS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Briefly explain the concept of Hybrid printing system.
2. What is Electrophotography ? Give its application.
3. What is Re-Image able master ? Explain.
4. Write a note on computer to pres.
5. Why Digital printed pages are required ? Briefly explain.
6. Give the advantages of Raster Image processing.
7. With a neat sketch, explain Dye Sublimation printer.
8. Why Thermal printer is required ?
9. What is meant by Large Format Inkjet Printer ? Explain.
10. Write a note on Nozzle head of Digital printing machine.
11. Explain the concept of Computer to Screen for Screen Printing
12. Compare conventional and re-image able digital plate.
13. What is interpreter interaction in Digital pre-press ?

Turn over

14. Give the application of SCSI ports.

15. For commercial application which inkjet is suitable ?— Justify.

(10 × 5 = 50 marks)

Part B

16. Explain about substrates, workflow and imaging system in CTP for flexography printing.

Or

17. What is Computer to Cylinder for Gravure Printing ? Explain the need of such system and its advantages and dis-advantages.

18. How Direct Imaging is done with removal of master for each job ? Explain.

Or

19. Explain the Concepts of Re- image able Master with material application/Ablation.

20. Explain Raster Image Processor integration and execution.

Or

21. Consider the case of a package printing unit and explain a suitable digital pre-press workflow for the same.

22. Explain different parts of an inkjet printer.

Or

23. How to choose substrate for Inkjet Printing ? Explain the issues related to the same.

24. Compare large format inkjet printer with a Desktop inkjet printer.

Or

25. Explain the on going trends in inkjet printing.

(5 × 10 = 50 marks)

D 123903 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 604—DIGITAL SYSTEM DESIGN

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

I. 1 List out the essential features of VHDL language.

2 Compare assert and report.

3 Explain about process statement.

4 Differentiate between libraries and packages in VHDL.

5 Describe about structural design elements.

6 State the design difference of adders and Subtractors.

7 State the rules to perform bubble-to-bubble logic ?

8 What is propagation delay ? Explain.

9 Explain the functionality of mixed operating mode circuit.

10 Give the excitation table for D flip flop along with their characteristic equations.

11 Explain feedback sequential circuit in brief.

12 With a transition table, explain the concept of critical race, non-critical race and cycle.

13 Draw the ASM chart for MOD-5 counter.

Turn over

14 Describe about Xilinx XC 4000 in brief.

15 Illustrate the XC 4000 general interconnect structure

(10 × 5 = 50 marks)

Part B

Answer any **five** *questions.*

II. 1 Explain in detail about types, constants and arrays.

Or

2 With suitable example discuss the various data flow design elements.

3 Write the VHDL code to realize a 4-bit magnitude comparator.

Or

4 Design comparators using VHDL.

5 Discuss the salient features of circuit timing and timing specifications.

Or

6 Explain in detail of bubble-to-bubble logic design.

7 Design a sequential circuit with two DFFs A and B, and one input x. When $x = 0$ the state of the circuit remains the same. When $x = 1$, the circuit goes through the state transition from 00 to 01 to 11 to 10 and back to 00 and repeats

Or

8 Design a synchronous sequential circuit that functions as a sequence detector to detect a sequence of 0110 using JK flip flop.

9 Discuss the analysis of circuits with multiple feedback loops with examples

Or

10 Explain the features of Xilinx XC 9500 CPLD family.

(5 × 10 = 50 marks)

D 123909 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 604—ANTENNAS AND PROPAGATION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Define radiation efficiency and HPBW of an antenna.
2. Define Gain and Directivity of an antenna.
3. Derive expressions for beam solid angle in terms of Directivity of an Antenna.
4. Explain the concept of retarded potential.
5. Explain binomial array.
6. Derive expressions and plot the pattern for the field radiated by two isotropic point sources fed with current of same magnitude and phase.
7. Explain the concepts and benefits of smart antennas.
8. With neat diagrams explain the principle of operation of a Horn antenna.
9. What is the difference between fixed weight beamforming and adaptive beam forming.
10. Explain log periodic antenna.
11. List the major advantages and disadvantages of the patch antenna.
12. Describe frequency independent radiating structures with any two examples.
13. Explain ground wave propagation.
14. Explain about Ionospheric abnormalities.
15. Explain the multi path propagation effects.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *question from each module.*

16. Define radiation resistance of an antenna. Express it in terms of the total power radiated.

Or

17. Draw an experimental setup and explain how radiation pattern measurement of an antenna is carried out.

18. Design a seven element Dolph -Tschebyscheff array with inter element spacing of $\lambda/2$. The pattern is to be optimized with a side lobe level of 20 dB down the main lobe maximum.

Or

19. Plot the radiation pattern of a 4 element linear broadside array with isotropic point sources with spacing $d = \frac{\lambda}{2}$. Find BWFN of the array.

20. With neat diagrams explain the working of a V antenna and rhombic antenna and their uses.

Or

21. Explain parabolic reflector antenna and the two major feed methods in the Parabolic reflector antenna with proper diagrams.

22. Distinguish between normal mode and axial mode helical antenna.

Or

23. Design a rectangular patch antenna on a dielectric substrate with dielectric constant of 2.65, height of 0.2 cm so as to resonate at 3 GHz.

24. Derive the expression for the field strength of Space Wave Propagation.

Or

25. Define skip distance, critical frequency and maximum usable frequency. Derive relation between critical frequency and maximum usable frequency.

(5 × 10 = 50 marks)

D 123915 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 604—DATA MINING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain the significance of knowledge mining from data.
2. Define data warehouse. How are organizations using the information from data warehouse ?
3. List the typical OLAP operations on multidimensional data.
4. Explain the methods of data transformation.
5. Specify the heuristic methods of attribute subset selection in data reduction.
6. Explain the procedure of performing class comparison.
7. How the efficiency of Apriori-based mining can be improved ? Explain.
8. Differentiate classification and prediction.
9. Explain multiple linear regression analysis in detail.
10. Enumerate the challenges of clustering in data mining.
11. What are binary variables ? How to compute the dissimilarity between two binary variables ?
12. How the scalability can be achieved in k-means algorithm ?
13. What is the role of data mining in telecommunication industry ?
14. Elaborate the types of approaches in text mining.
15. Highlight the challenges in mining World Wide Web.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. a) Illustrate the steps in the process of knowledge discovery with diagram.

Or

b) Demonstrate star and snowflake schema with diagram and tabulate the differences between star schema and a snowflake schema.

17. a) Discuss the role of data cleaning process in data pre-processing.

Or

b) Outline a data cube-based incremental algorithm for mining class comparisons.

18. a) Give the algorithm for generating strong rules from frequent itemsets.

Or

b) Write an algorithm for k-nearest neighbour classification given k and n, the number of attributes describing each tupule.

19. a) The data mining task is to cluster the following eight points into three clusters :

$A_1(2, 10), A_2(2, 5), A_3(8, 4), B_1(5, 8), B_2(7, 5), B_3(6, 4), C_1(1, 2), C_2(4, 9)$,

The distance function is Euclidean distance. Suppose initially we assign A1, B1, and C1 as the center of each cluster, respectively. Use the k-means algorithm to show only

i) The three cluster centers after the first round execution ; and

(5 marks)

ii) The final three clusters.

(5 marks)

Or

b) Explain the method of conceptual clustering in detail.

20. a) Discuss the advancements of data mining systems in the real world.

Or

b) Elaborate the concept of web log mining in web mining.

(5 × 10 = 50 marks)

D 123923 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 604—OPERATIONS RESEARCH

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Consider M/M/1 : α/FCFS queue. Parts arrive to a milling machine following a Poisson process at a rate of 10/hr. Machining time is exponentially distributed with a mean of 3 min. Find : (i) Average number of parts in the system ; and (ii) Average waiting time in Queue.

2. State the necessary and sufficient condition for the existence of a feasible solution to a transportation problem.

3. What are the multiple optimum solutions in Linear Programming Problem ? Explain with an example for the multiple optimum solutions.

4. How does an assignment problem differ from a transportation problem ? Explain.

5. What do you understand by degeneracy in a transportation problem ? Explain how degeneracy in transportation problem may be resolved.

6. Write the Kendal's notation for representing queuing models.

7. Solve the following linear programming problem by Big-M method ?

Maximize $Z = X_1 + 2X_2 + 3X_3 - X_4$ and

subject to constraints $X_1 + 2X_2 + 3X_3 = 15$,

$2X_1 + X_2 + 5X_3 = 20$,

$X_1 + 2X_2 + X_3 + X_4 = 10$ and $X_1\ X_2, X_3, X_4 \geq 0$.

Turn over

8. Write the dual of the following primal L.P.P :

Minimize : $Z = 4X1 + 5X2 - 3X3$

Subject to $X1 + X2 + X3 = 22$

$3X1 + 5X2 - 2X3 \leq 65$

$X1 + 7X2 + 4X3 \geq 120$ and $X_1 \geq 0$, $X_2 \geq 0$ and X_3 unrestricted.

9. Write short note on two person zero sums game

10. A company makes two kinds of belts. Belt A is of high quality and Belt B is of lower quality. The respective profits are Rs. 8 and Rs. 6 per belt. Each belt of type A requires twice as much time as belt of type B and if all belts were of type B, the company could make 1000 belts per day. The supply of leather is sufficient for 800 belts (both A and B combined). Belt A requires a fancy buckle and only 400 such buckles are available per day. There are only 700 buckles a day available for type B. Formulate the problem as LPP.

11. Depicts how a game problem is solved by Graphic method.

12. What are EMV and EOL criteria ?

13. Explain various inventory models.

14. What do you mean by EOQ ?

15. Indicate the difference between decision under risk and decision under uncertainty ?

(10 × 5 = 50 marks)

Part B

Each question carries 10 *marks.*

16. Discuss in detail about the importance of operation research in a engineering application

Or

17. Solve the following LPP by graphical method :

Maximize $Z = X_1 - 2X_2$

Subjected to $-X_1 + 2X_2 \leq 1$

$3X_1 + 2X2 \geq 12$

$0 \leq X_1 \leq 5$

$2 \leq X_2 \leq 4$

18. Solve the LP problem :

$$\text{Minimize } Z = 20X_1 + 24X_2 + 18X_3$$

$$\text{Subjected to } 2X_1 + X_2 + X_3 \geq 30$$

$$X_1 + X_2 + X_3 \geq 20$$

$$X_1 + 2X_2 + X_3 \geq 24$$

$$X_1, X_{2,3} \geq 0$$

Or

19. Solve the LP problem :

$$\text{Maximize } Z = 3X_1 + 5X_2 + 4X_3$$

$$\text{Subjected to } 2X_1 + 3X_2 \leq 8$$

$$2X_2 + 5X_3 \leq 10$$

$$3X_1 + 2X_2 + 4X_3 \leq 15$$

$$X_1, X_2, X_3 \geq 0$$

20. A department head has *four* subordinates and *four* tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. The estimate of the time each subordinate would like to perform a task is given in the effectiveness matrix in table 1. How should the task be allocated, one to a person, so as to minimize the total man hours ?

Table 1

Subordinate

Task	I	II	III	IV
A	9	27	18	12
B	14	29	5	27
C	39	20	19	16
D	20	27	25	11

Or

Turn over

21. Find the initial feasible solution and optimum solution of given transportation problem given in table 2 :

Table 2

	D1	D2	D3	*Supply*
O1	2	7	4	5
O2	3	3	1	8
O3	5	4	7	7
O4	1	6	3	14
DEMAND	7	9	18	

22. Describe some methods which are useful for decision making under uncertainty.

Or

23. Solve the following 2 × 2 game shown in table 3 without and with saddle point.

Table 3

	Player B	
Player A	6	– 3
	– 3	0

24. A self-service store employs one casher at it is counter. 9 customers arrive on average of every 5 minutes, while the cashier can serve 10 customers in 5 minutes. Assuming Poisson distribution for arrival and exponential distribution for service. Determine average no of customer in the system, average no of customer in the queue, average time a customer spent in the system and average time a customer spends in the queue.

Or

25. Explain any *two* inventory models with its assumptions.

(5 × 10 = 50 marks)

D 123929 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 604—TONE AND COLOUR ANALYSIS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *mark.*

1. Briefly explain memory colours.
2. What is metamerism ? Explain.
3. What is copy dot scanning and rescreening ? Explain.
4. Write a note on bitmap image.
5. What is colour correction ? Briefly explain.
6. How masking is done in printing industry ?
7. What is positive masking ? Explain.
8. Why double overlay masking is required ?
9. What is meant specular density ? Explain.
10. Write a note on Densitometry.
11. What is color calibration ?
12. Give the application of pantone color.
13. What is integral color masking ?

Turn over

14. Mention the advantages of double overlay masking.

15. What is proportionality failure ?

(10 × 5 = 50 marks)

Part B

16. What is colour engine ? And compare RGB and HSB model.

Or

17. Why Colorimeter and spectrophotometer are used ? Give the advantages respectively.

18. When to go for AM and FM screening ? Also explain Digital Halftone.

Or

19. How to choose a scanner ? Also explain about scanner workflow and resolution.

20. Why Digital Colour separation is required ? Give its applications and advantages.

Or

21. Consider the case of a package printing unit and explain a ink colour sequence and the need of manual retouching.

22. Explain Gray Balance and Tone reproduction in Publication Printing industry.

Or

23. Explain Gray intensification and un-sharp masking in commercial printing industry.

24. Why colour control strips and punch register systems are required ? Give the application and advantages respectively.

Or

25. For a publication printing unit what are the different quality control aids required to maintain quality output ?

(5 × 10 = 50 marks)

D 123904 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 605 (B)—HIGH VOLTAGE ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

I. 1 Outline concept of anode and the cathode streamers ?

2 State the factors which affect breakdown of gaseous dielectrics

3 Discuss about composite dielectric ? List its properties ?

4 Give the basic principle of electrostatic generator ?

5 Differentiate between spark over, flash over and puncture ?

6 How is impulse current generated using capacitor bank ? Explain it in detail

7 Explain the Hall effect generator for measuring high dc current

8 Explain the effect of nearby earthed objects on the measurements using sphere gaps ?

9 Write about Magnetic links

10 Explain the transformer ratio arm bridge for audio frequency range measurements.

11 Discuss the factors affecting discharge detection.

12 Describe the measurement methods of radio interference.

13 Write short notes on reflection and refraction of travelling waves.

14 Describe the various tests conducted on generators

15 Explain the methods employed for lightning protection of OH lines ?

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **five** *questions.*
Each question carries 10 *marks.*

II. 1 Explain the various theories that explain breakdown in pure and Commercial liquid dielectrics.

Or

2 Describe the Paschen's law and its significance.

3 With a neat sketch explain the Cockcroft - Walton voltage multiplier circuit for generation of high DC voltages.

Or

4 Discuss elaborately the principle and operation of impulse current generator.

5 Explain briefly the Electrostatic Voltmeter. Also list the advantages and disadvantages.

Or

6 Briefly explain arrangements of Rogowski coil and magneto optic methods for high current measurements.

7 Briefly explain how partial discharges in an insulation system can be detected and displayed.

Or

8 Explain with neat diagram the operation of pulse current measurement of partial discharges by straight detection technique.

9 What are the mechanisms by which lightning strokes develop an induce over voltages on overhead power lines ? Explain.

Or

10 Explain the different electrical tests done on isolators and circuit breakers.

(5 × 10 = 50 marks)

D 123910 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 605 (D)—SATELLITE COMMUNICATION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain Orbital perturbations.
2. Show how to locate the satellite with respect to earth.
3. List the basic factors affecting satellite position.
4. Explain the expandable launch vehicles.
5. What is sun transit outage ?
6. Explain the effect of solar eclipse on the satellite performance.
7. Write briefly on satellite antennas in practice.
8. What is a Transponder ?
9. Explain the 2 types of rocket motors used in launch vehicle.
10. A satellite at distance of 40,000 km from a point on the earth's surface radiates a power of 10W from an antenna with a gain of 17 dB in the direction of the observer. Find the flux density at the receiving point, and the power received by an antenna at this point with an effective area of $10m^2$.
11. Discuss the satellite communication link procedure.
12. Explain the input backoff and output backoff.
13. Explain the TDM A frame structure.
14. Explain the GPS.
15. Explain the intermodulation of FDMA with a suitable example.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **one** *question from each module.*

16. Express the three Kepler's laws of planetary motion and list the various orbital parameters.

Or

17. What are look angles ? Explain how they are determined for geo stationary orbits ?

18. Explain the different methods to place satellite into geostationary orbit.

Or

19. A satellite is orbiting in a geosynchronous orbit of radius 42,000 km. Find the velocity and time period of the orbit. Also, determine the change in velocity required if the radius of the orbit is to be reduced to 36,500 km. Assume g_o= 398600.5 km^3/s^2.

20. What is the telemetry, tracking, command, and monitoring sub system ? Explain its functioning using a neat block diagram.

Or

21. Differentiate the single conversion transponders and double conversion transponders with suitable sketches.

22. Explain the method to calculate the system noise temperature in satellite communication receivers.

Or

23. Derive the transmission equation.

24. Explain the VSAT earth station engineering.

Or

25. Write notes on DBS system.

(5 × 10 = 50 marks)

D 123916 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Information Technology

IT 19 605 (A)—HUMAN COMPUTER INTERACTION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. Explain The execution-evaluation cycle in interaction
2. Describe the concept of Short Term Memory for Temporary recall of Information.
3. Explain about Chord keyboards as a Text Entry device.
4. Explain the process of Grouping and Structure in screen design and layout.
5. Illustrate some of the problems with Usability Engineering.
6. Describe the Integration and testing process of software life cycle in HCI.
7. Explain the roles of window manager in windowing systems and the importance of it.
8. Discuss about the tool kits for fusing input and output behaviours.
9. Describe the meaning of Universal design in HCI with an example.
10. Discuss about the transfer effects and personal space in face to face communication.
11. Briefly explain the three state model of input devices in Physical and Device model.
12. State some of the organizational issues with examples.
13. Explain about Video conferences and communication in computer mediated communication.
14. Explain the role of Virtual collaborative environments in Computer Mediated Communication
15. Explain the role of Meeting rooms in Human computer Interaction.

(10 × 5 = 50 marks)

Turn over

Part B

Answer **one** *full section from each question.*
Each question carries 10 *marks.*

16. a) Explain in detail about Input and Output Channels of the human with a basic need for HCI.

Or

b) Describe the arrangement of controls and displays in Ergonomics.

17. a) Explain in detail about Navigation design in HCI.

Or

b) Describe in detail about Principles to support Usability.

18. a) Illustrate the concept of Evaluation through Expert Analysis.

Or

b) Explain in detail about how a design can be made in HCI for persons with visual impairment.

19. a) Explain in detail about Text based communication.

Or

b) Describe about Linguistic model and its significance in HCI.

20. a) Explain about the concept of Time Space matrix in Group ware systems with block diagram.

Or

b) Explain with a Case study about Ubiquitous Computing Applications Research and its significance in HCI applications.

(5 × 10 = 50 marks)

D 123924 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 605 (A)—GAS DYNAMICS AND JET PROPULSION

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Write the difference between laminar and turbulent flow.
2. State the difference between compressible and incompressible fluid.
3. Name the different regions of compressible fluid flow.
4. Compare adiabatic flow and diabatic flow.
5. What are the types of Nozzle and diffuser ?
6. What is choked flow through a nozzle ?
7. Shock waves cannot develop in subsonic flow ? State the reason.
8. Briefly discuss the applications of moving shock wave.
9. Briefly explain the properties changes across a normal shock.
10. Differentiate between Fanno flow and Rayleigh flow.
11. Describe the assumptions made for fanno flow.
12. Give practical examples where the fanno flow occurs.
13. Write the significance of Ram effect in Ram jet engine.

Turn over

14. Discuss the various types of air breathing engine.

15. Define the terms : (i) UDMH ; and (ii) JATO.

(10 × 5 = 50 marks)

Part B

Answer **one full** *section from each question.*
Each question carries 10 *marks.*

16. (a) The jet of a gas at 500 K has a Mach number of 1.2. Determine the following :

(i) Local velocity of sound.

(ii) Stagnation velocity of sound.

(iii) Static enthalpy.

(iv) Stagnation enthalpy.

(v) Maximum attainable velocity of this jet. Take $(\gamma = 1.3, R = 469 \text{ J/kg.K})$.

Or

(b) A plane travels with a velocity of 1600 km./h. at an altitude where the pressure and temperature are 40 kPa and – 35° C. Find the Mach angle and Mach number.

17. (a) The velocity, pressure and temperature of a duct are 320 m/s, 1 bar and 295 K. Calculate the following :

(i) Stagnation pressure.

(ii) Stagnation temperature.

(iii) Velocity of sound in dynamic condition.

(iv) Velocity of sound in Stagnation condition.

(v) Stagnation pressure assuming constant density.

Or

(b) A gas is isentropically expanded from p = 10 bar and T = 525°C in a nozzle to a pressure of 7.6 bar. If the rate of flow of the gas is 1.5 kg/s determine : (a) Pressure, temperature and velocity at the nozzle throat and exit ; (b) Maximum possible velocity attainable by the gas ; and (c) The type of the nozzle and its throat area. Take (γ = 1.3, R = 464 J/kg. K).

18. (a) When a converging diverging nozzle is operated at off-design condition a normal shock occurs at a section where the cross sectional area is 18.75 cm^2 in the diverging portion at inletthe nozzle the stagnation state is given as 0.21 MPa and 36°C. The throat area is 12.5 cm^2 and exit area is 25cm^2. Estimate the exit Mach number, exit pressure loss in stagnation pressure for flow through nozzle.

Or

(b) A jet of air approaches a symmetrical wedge of a Mach number of 2.4 and wave angle of 60°. Determine the following :

(i) Deflection angle.

(ii) Pressure ratio.

(iii) Temperature ratio.

(iv) Final Mach number.

19. (a) The friction factor for a 25 mm. diameter 11.5 m. long pipe is 0.004. The condition of air at the entry are P_1 = 2.0 bar T_1 = 301 K M_1 = 0.25. Determine the mass flow rate, and the pressure, temperature and the Mach number at exit.

Or

(b) The condition of a gas in a combustion chamber at entry are T_1 = 375 K, P_1 = 0.50 bar, C_1 = 70 m/s. The air fuel air ratio is 29 and the calorific value of the fuel is 42 MJ/kg. Calculate :

(i) The initial and final Mach number.

(ii) Final pressure, temperature and velocity of the gas.

Turn over

(iii) Percentage of stagnation pressure loss.

(iv) Maximum stagnation temperature.

20. (a) With a neat sketch, explain the working principle of operation of a pulse jet engine.

Or

(b) Compare turbo prop engine and turbo jet engine.

(5 × 10 = 50 marks)

D 123930 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 605(D)—BOOK PUBLISHING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. With any diagram explain the anatomy of a book.
2. Explain the merits and demerits of direct promotion techniques male order advertising and subscription books.
3. Explain about the guidelines set by the university college and professional publishing council.
4. Compare the process for the man-made binding and the perfect binding process and explain the merits and demerits of both the process.
5. Explain the intervention of computers in the binding and the finishing operations for a book making process.
6. What are the legal aspects to be considered for a book publishing ? Explain in detail.
7. What is web design and publishing and what is the scope of it in the current world ? Explain in detail.
8. Explain the importance of the outright sale of copyright in a book publishing process.
9. What are the factors to be considered in a commission agreement framed between the publisher and the author in a book publishing process ? Explain in detail.
10. Explain in detail about Professional Publishing and Reference Publishing.
11. Explain the roles and responsibilities of Commissioning editor and the desk editor in a publishing house.

Turn over

12. What are the various promotion channels which are available for book publishing industry ?

13. Compare the mechanical binding and the loose leaf binding processes and explain the merits and demerits of both the processes.

14. Explain the difference between laminating and varnishing and explain the merits and demerits of both the processes.

15. Explain any *two* software which are necessary and widely used in the market for book publishing.

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each section.*

Each question carries 10 *marks.*

16. (a) Explain the editorial techniques such as style sheet reference aids the author and his manuscript for book publishing.

Or

(b) Explain the importance of quality control aspects from the stage of proofing, financial aspect, first copy cost and manufacturing cost and overheads.

17. (a) Explain the economics of distribution which can be utilised for book publishing industry.

Or

(b) Explain the working of automatic and semi-automatic binding machines and explain the merits and demerits of both the types of machines.

18. (a) Explain the importance of manuscript formats and file management in the process of book publishing.

Or

(b) Explain in detail about the agreement of sale of translation rights.

19. (a) Explain the importance of Copy editing in editorial process and development.

Or

(b) Mention some of the laws and ethics which are related to book publishing.

20. (a) What are the various securing operations which can be performed in a book binding process ? Explain in detail.

Or

(b) What are the implications of copyright act on book publishing ? Explain in detail.

(5 × 10 = 50 marks)

D 123932 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 605 (A)—PRINTRONICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Discuss the advantages of printed electronics (PE).
2. What is the future scope of printed electronics ?
3. Explain the role of printing technology in electronics manufacturing.
4. Write notes on various printing parameters to be considered for PE devices.
5. Discuss about offset-gravure for the applications of PE.
6. Explain electro-static inkjet printing and its applications.
7. Discuss about metal-organic decomposition ink.
8. Explain the low-temperature fabrication of metal nanowire TCF.
9. Explain the features of various polymer-based conductive materials.
10. Write notes on organic field effect transistors.
11. Explain the important requirements for PE interconnection technology.
12. Discuss the features of anisotropic conductive adhesives.
13. What are the recent developments in PE ? Explain.

Turn over

14. Explain the construction and working principle of printed solar cells.

15. What is the role of PE in smart packaging ?

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each section.*

Each question carries 10 *marks.*

16. Discuss the role of printed electronics in lighting and display.

Or

17. Explain various products of printed electronics.

18. Give an account of various post-treatments done on printed circuits or devices.

Or

19. With neat diagrams, explain the working principle and applications of micro-contact printing and electrostatic inkjet.

20. Discuss the applications of various conductive materials in PE.

Or

21. Discuss the features of whiskers and transparent conductive films.

22. Explain various reliability issues existing in PE products.

Or

23. Compare the features of various substrates used for printed electronics.

24. Explain various quality control devices used for PE.

Or

25. Discuss various interconnection methods used in printed electronics.

(5 × 10 = 50 marks)

D 123933 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 605(F)—ANALYSIS OF PRINTING INK

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Write notes on defoamers and plasticizers.
2. Discuss the types and features of carbon blacks.
3. Compare diarylide yellow and Hansa yellow pigments.
4. With a neat diagram, explain the working of a three-roll mill.
5. Compare the features of publication and packaging gravure inks.
6. Discuss different types of textile printing inks using screen printing.
7. Explain the composition and working of magic inks.
8. Explain the composition, advantages, and disadvantages of UV curing ink.
9. Discuss the features of magnetic and iridescent inks.
10. Write notes on surface energy and contact angle.
11. Explain the constituents and properties of roller coatings.
12. Write notes on the features of various viscometers.
13. Discuss the influence of humidity on ink properties.

Turn over

14. Write notes on various printing problems that can occur due to ink.

15. Discuss recent developments in the printing ink industry.

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each section.*

Each question carries 10 *marks.*

16. Discuss various types of resins used in printing ink.

Or

17. Discuss various types of organic pigments used in printing inks.

18. Give an account of flexographic inks.

Or

19. Explain the process of manufacturing liquid inks with a neat diagram.

20. Compare absorption and evaporation drying mechanisms.

Or

21. Discuss various types of security printing inks and their features.

22. Compare chemical and laser assisted surface modification of printing substrates.

Or

23. Explain various coating mechanisms.

24. Define and explain the importance and testing procedure of following ink properties :

    (i) Gloss.

    (ii) Wet ink film thickness.

    (iii) Water resistance.

Or

25. Explain 5 end use properties required by printing inks with examples.

(5 × 10 = 50 marks)

D 123934 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 605 A—BIOMEDICAL ENGINEERING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Give a brief anatomy of respiratoxy system.
2. Explain the range and sensitivity of an instrument.
3. Explain biometrics.
4. What are the sources of bio electrical potential ?
5. What are the characteristics of EMG signal ?
6. Explain the ECG read out device.
7. What are cardiac pacemakers ? List different types of pacemakers.
8. Explain the defibrillators.
9. Explain the impedance plethysmography.
10. Describe any *four* parameters based on which performance of dialyzers can be analysed.
11. Explain the working of ventilators.
12. Write short note on respiratory pneumography.
13. What is the significance of Compton effect in CT image reconstruction ?

Turn over

14. Explain different methods of electric accident prevention.

15. Explain about micro shock hazards.

(10 × 5 = 50 marks)

Part B

Answer any **one** *question from each module.*

16. (a) Give an account of anatomy of nervous system with neat sketches. (10 marks)

Or

(b) Explain the objectives of man-instrument system. (10 marks)

17. (a) Explain the different transducers used for biomedical applications. (10 marks)

Or

(b) Explain the working of ECG machine with neat diagram. (10 marks)

18. (a) Explain any *two* types of indirect method of blood flow measurement. (10 marks)

Or

(b) Explain the working of phonocardiography with neat sketches. (10 marks)

19. (a) Explain the working of infant incubator with neat sketches. (10 marks)

Or

(b) What are brain waves ? How do you measure EEG waves ? What are the applications of EEG ?

20. (a) Explain the working of ultrasonic imaging system. What are the important applications of ultrasound in biomedical applications ?

(10 marks)

Or

(b) With the help of a block diagram explain the basic principle and working of Computer tomograph.

(10 marks)

[5 × 10 = 50 marks]

D 123935 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Information Technology

IT 19 605 B—SOFT COMPUTING

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain with a neat sketch Supervised Hebbian learning.
2. Discuss any *five* applications of soft computing.
3. Write short notes on Hop field Net.
4. List the fuzzy set properties with suitable proof.
5. What is defuzzification ? Explain its significance.
6. Explain any *two* operations on fuzzy sets with examples.
7. What is fuzzy inference system? Explain
8. Explain the importance of aggregation of fuzzy rules.
9. What is Neuro fuzzy system ? Explain.
10. Write short notes on selection and cross over.
11. What are the characteristics of an efficient genetic algorithm ?
12. Explain the operators involved in a genetic algorithm.
13. How does a harmony search algorithm work ? Discuss.

Turn over

14. State the significance of using SVM.

15. What are the potential applications of swarm intelligence ?

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each Section.*
Each question carries 10 *marks.*

16. (a) With a neat sketch, explain the basic neural network architecture. Explain the perceptron learning model in detail.

Or

(b) Explain in detail the Backpropagation principle and the associative learning principle.

17. (a) Explain in brief the various methods of fuzzy membership assignments.

Or

(b) Briefly discuss the concept of lamba cuts for fuzzy sets.

18. (a) Explain in detail the significance of a fuzzy interference system.

Or

(b) Describe the requirements and characteristics of neuro fuzzy hybrid systems.

19. (a) Discuss the significance of fuzzy rule-based systems ?

Or

(b) Compare and contrast coding, crossover and mutation functions in brief.

20. (a) Explain the significance of evolutionary strategies in real time.

Or

(b) Write the improved harmony searchalgorithm and discuss its correctness.

(5 × 10 = 50 marks)

D 123936 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 605 E—COMPOSITE MATERIALS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

1. State the mechanical advantage of composites and specify any *five* applications of modern composites in aircraft industries.
2. Specify any *five* characteristics of particulate-based composites.
3. Brief about the effect of wettability in interface bond strength of composites.
4. How are the glass fibers manufactured ? Illustrate with a simple sketch.
5. Describe the steps involved in the fabrication of any *one* thermosetting resin matrix composites.
6. What are metal matrix composites ? Specify any *two* applications.
7. Name any *two* failure modes of a fiber-reinforced composite specimen under uniaxial tensile and compression testing with a schematic.
8. What is interlaminar fracture toughness ? Specify any *one* method used to find the interlaminar fracture toughness.
9. Schematically illustrate the ultrasonic test used for damage identification in composite laminates.
10. Draw the stress-strain plot of a unidirectional composite loaded in the fiber direction and specify different points in it.
11. Discuss the role of the rule of mixtures in determining the longitudinal strength of unidirectional composites.
12. What are balanced laminates ? Brief with example.
13. List the different polishing methods and specify the challenges associated with polishing composite materials.

Turn over

14. Schematically illustrate the different welding configurations of composite joints and specify any *one* key characteristics for each.

15. Describe the principle of ultrasonic welding in composite joining with a schematic.

(10 × 5 = 50 marks)

Part B

Each question carries 10 *marks.*

16. Classify and brief the different types of composites with the help of a flow chart.

Or

17. Explain the different types of bonding at the interface in composites.

18. What are the needs for surface treatment in fibers ? Describe any *one* surface treatment process.

Or

19. Describe the fabrication method of ceramic matrix composites with a flow chart.

20. Explain the role of specimen geometry and loading configuration in the testing of composite specimens.

Or

21. Compare and contrast the features of X-radiography and acoustic emission methods in damage assessment of composites.

22. List and briefly explain the common failure modes in unidirectional lamina subjected to transverse load.

Or

23. Enumerate the steps in the analysis of laminated composites based on classical laminate theory.

24. Discuss the effect of delamination on surface quality during the drilling of composite laminates.

Or

25. With a neat sketch explain the process of water jet cutting used in composite postprocessing and state the benefits.

(5 × 10 = 50 marks)

D 123905 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE [2019 SCHEME] EXAMINATION, APRIL 2025

Electrical and Electronics Engineering

EE 19 606 (F)—RENEWABLE ENERGY SYSTEMS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*
Each question carries 5 *marks.*

I. 1 Compose the environmental impact of fossil fuels.

2 Compare the conventional and non-conventional energy sources.

3 State the necessity of energy storage.

4 List the advantages of solar PV system.

5 Express the advantage of solar concentrators.

6 Classify the application of solar PV System.

7 Illustrate the limitations of tidal power generation.

8 Explain the factors determines the maximum length and height of ocean waves.

9 Illustrate OTEC open cycle.

10 Explain the properties of wind.

11 Compare the VAWT and HAWT.

12 State the advantages and Disadvantages of WECS.

13 Give details of some organic materials used in biomass plant.

14 Point out the factors affecting biogas generation.

15 Draw the schematic of fuel cell.

(10 × 5 = 50 marks)

Turn over

Part B

Answer any **five** *questions.*
Each question carries 10 *marks.*

II. 1 Evaluate the important role of conventional and non- conventional energy sources.

Or

2 Generalize the present Indian and international energy scenario of conventional and RE sources.

3 Explain in detail about the construction of solar cell, solar module and solar array.

Or

4 Summarize in detail about the construction and working principle of Solar Thermal Power Plant.

5 Describe in detail the operation of double basin type tidal power plant.

Or

6 Explain the Methods of OTEC power generation in detail.

7 Explain the construction and working of Vertical Axis Wind Turbine.

Or

8 Derive the expression for Power in the wind and Electrical Power Output in WECE's.

9 Explain the impacts of biomass construction, production and operation.

Or

10 Describe working principle of fuel cell with neat sketch and draw the performance characteristics of hydrogen-oxygen fuel cell.

(5 × 10 = 50 marks)

D 123911 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Electronics and Communication Engineering

EC 19 606 (C)—ENTERTAINMENT ELECTRONICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain the recording process in compact disc with a neat diagram.
2. Explain the working of carbon microphone.
3. Write short note on Hi-Fi Stereo reproducing system.
4. With diagram, explain VHS tape transport mechanism.
5. Explain the working of a crystal loud speaker.
6. Draw the block diagram of a VCR.
7. Identify few applications where Public Addressing system is necessary.
8. List any 5 characteristics of a PA system.
9. Draw a simple block diagram of a PA system and explain.
10. Give an account on the concept of luminance.
11. Draw the block diagram of a closed-circuit television.
12. Define the terms hue and saturation in the context of colour TV.
13. Explain the working principle of an induction cooker.

Turn over

14. Using a simple block diagram, explain the working of a washing machine.

15. How does an air conditioner produce cooling effect ? Explain.

(10 × 5 = 50 marks)

Part B

Answer any **one** *question from each module.*

16. Explain the construction, working principle and applications of moving coil microphone.

Or

17. Explain the construction and working principle of dynamic headphones.

18. Explain the construction and working of condenser loud speaker.

Or

19. An auditorium is to be designed with a good sound system. Suggest suitable design aspects and considerations to ensure that reflection, absorption of sound and reverberation are minimal.

20. A band performance is to be conducted in an open ground. What are the requirements the organizers will have to ensure in the PA system for quality sound ?

Or

21. Explain in detail any *five* characteristics of loud speakers employed in PA systems.

22. With a neat block diagram, explain monochrome TV receiver.

Or

23. What is meant by scanning in television ? Explain any *two* types of scanning.

24. Illustrate with a block diagram, the working of an electronic calculator.

Or

25. Explain the various hardware parts in a mobile phone.

(5 × 10 = 50 marks)

D 123919 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Information Technology

IT 19 606 (A)—CYBER LAW AND ETHICS

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Explain about Data Encryption in Information Security of Computers.
2. Discuss shortly about the need of Data Protection and Privacy laws.
3. Discuss in detail about Patent with respect to Computer Programs.
4. Illustrate about Web-Wrap licenses for Off-the-Shelf software.
5. Discuss about training and support with respect to software contracts.
6. Discuss about the significance of Contract between software author and publisher.
7. List out the legal challenges in Cyber crime.
8. List and explain some of the offenses with respect to computer crimes.
9. Explain the Challenges in IoT Security.
10. Outline the procedures for organizations to report data breaches to the relevant supervisory authority.
11. Describe the outcomes of Patent law.
12. List out the steps in the Enforcement of Data Protection Act 1984.

Turn over

13. Describe the basic steps in Information Processing.

14. Explain Identity theft in ICT crime.

15. Illustrate the impact of ICT in health care.

(10 × 5 = 50 marks)

Part B

Answer **one full** *section from each question.*

Each question carries 10 *marks.*

16. (a) Describe in detail about various threats to security of computers.

Or

17. (b) Explain in detail about some of the Computer Security legislations.

18. (a) Explain in detail about the Assignment of Agreement in contracts for software writing. Also explain the benefits and burdens of software contract.

Or

19. (b) Discuss in detail about the performance bond in hardware contracts.

20. (a) Explain in detail about the responsibilities of employee in a firm to prevent computer crimes in their firm.

Or

21. (b) Discuss about the harmful effects of computer hacking.

22. (a) Explain the procedure for obtaining a patent in the UK with relevant block diagram.

Or

23. (b) Describe in detail about Data Protection with respect to computer generated works.

24. (a) Explain in detail about the code of conduct of computer professional in ICT field.

Or

25. (b) Explain the impact of ICT crimes on economy of a country.

(5 × 10 = 50 marks)

D 123925 **(Pages : 4)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Mechanical Engineering

ME 19 606 (B)—QUALITY ENGINEERING AND MANAGEMENT

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Enumerate the 4 costs of quality.
2. What is customer satisfaction ? Briefly enumerate it.
3. With suitable example, What is six - sigma ?
4. Write the significance of ISO quality management system.
5. With suitable example, write short notes on benchmarking.
6. Elucidate about Matrix diagram.
7. Briefly discuss about the patterns of variation.
8. Write the depiction for probability distribution function.
9. State the difference between normal distribution and standard distribution.
10. Write the significance of variables control chart.
11. Briefly describe about *np*-chart formula.
12. What are attributes ? Write an example for attribute.
13. Briefly discuss about sampling plan.

Turn over

14. Elucidate the *four* 4 types of sampling.

15. Briefly explain life testing in reliability.

(10 × 5 = 50 marks)

Part B

Answer **one full** *section from each question.*

Each question carries 10 *marks.*

16. (a) Explain the Six sigma principles and methodologies in detail.

Or

(b) Suggest any *five* ways to ways to improve customer satisfaction and retention.

17. (a) What is QFD ? Explain the house of quality process with suitable diagram.

Or

(b) Conduct the FMEA analysis of one of the four scenarios that are listed below. Make sure to identify four to six failure modes and provide appropriate controls and calculate the risk priority number.

(1) A crew of men is to remove for disposal a large array of powerful interconnected lead/acid batteries used as back-up power for an elevator in a multistory office building. The men are temporary contract workers with no prior experience with this activity. The battery bank is located on the concrete floor of the basement and is surrounded by a metal cage with a man door at one end.

(2) A crew of men is making roof repairs on a gently sloped flat metal roofed building. There are 3 unshielded energized high tension power lines which pass over the top of the building less than 7 feet from the roof top.

18. (a) Explain the various statistical tools used for quality control in detail.

Or

The table showing the values of the results for two companies A, and B :

		Company A Rs.	*Company* B Rs.
No.of employees	...	900	1,000
Avg Daily wages	...	250	220
Variance in distribution of wages	...	100	144

(1) Which of the company has a larger wage bill ?

(2) Calculate the co-efficients of variations for both of the companies.

(3) Calculate the average daily wage and the variance of the distribution of wages of all the employees in the firms A and B taken together.

19. (a) What are X-R control charts ? Explain the steps in the construction of X-R control charts ?

Or

(b) Monitor the number of defects found in each inspected bolt (large bundle) of cloth. The data from 20 inspections are recorded in the table given below :

Bolt of Cloth	:	1	2	3	4	5	6	7	8	9	10
No. of Defect	:	10	19	5	9	2	8	7	13	3	2
Bolt of Cloth	:	11	12	13	14	15	16	17	18	19	20
No. of Defect	:	22	4	6	9	7	2	5	12	4	2

(i) Which control chart should be used in this case ? Calculate the control limits for this chart.

(ii) Do these data from a controlled process ? If not, calculate the revised control limits

Turn over

20. (a) Compare the Double Sampling Plan with Single Sampling Plan in Supply Chain Management System. Write its inference.

Or

(b) A consumer receives lots of 5000 candles from a new supplier. To check the quality of lots, the consumer and supplier want to use the single sampling plan which satisfies a consumer's risk of 5 % for lots of quality 5 %. Determine sampling plans for the specified consumer's risk and LTPD for acceptance number c = 3 and 6.

[5 × 10 = 50 marks]

D 123931 **(Pages : 2)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 606 (F)—DISASTER MANAGEMENT

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. Give a measure to control the Drought problem in India.
2. Can Earthquakes be controlled ? Explain.
3. What is Biological disaster ?
4. What is the role of education in disaster management ? Briefly explain.
5. Training is very important for Disaster Management - Justify.
6. How engineers can control disaster management ?
7. Why Disaster Management act is required ?
8. Give the application of GPS in disaster management.
9. Write a note on Disaster safe design.
10. Explain the steps to be taken for electric shock during any casualties.
11. What is TREMCARD in Disaster management ?
12. Fire protection is very important in India - Justify.
13. How to make improvised floating aids ?

Turn over

14. Use of life jacket is an important safety aid - Justify.

15. What is chair knot ? Explain.

(10 × 5 = 50 marks)

Part B

16. What is Urban and forest fire ? Explain any *one* type and also measures to prevent such disaster.

Or

17. What is nuclear accidents and industrial disaster ? Explain any *one* type and also measures to prevent such disaster.

18. During Disaster Role of Government and international organizations, is very essential - Justify with a suitable example / case.

Or

19. NGO bodies play an important role in Disaster prevention and management. Explain with a suitable example / case

20. Which is the Mega disasters of India and lessons learnt ? Explain with a suitable example / case.

Or

21. Give the applications of Department of science and technology in disaster management.

22. How to overcome Chocking and breathing difficulties during Disaster management.

Or

23. Conceptualize a Firefighting system for an industry.

24. How society can support the NDRF teams during Emergency ? Explain with example.

Or

25. Can any biological disaster be controlled using software ? Explain with example.

(5 × 10 = 50 marks)

D 123937 **(Pages : 3)** **Name.....**

Reg. No.....

SIXTH SEMESTER B.TECH. (ENGINEERING) DEGREE (2019 SCHEME) EXAMINATION, APRIL 2025

Printing Technology

PT 19 606 C—INDUSTRIAL POLLUTION CONTROL

Time : Three Hours Maximum : 100 Marks

Part A

Answer any **ten** *questions.*

Each question carries 5 *marks.*

1. What is ozone hole ? What are the causes of ozone hole formation ?
2. Discuss the role played by over population in causing pollution.
3. Differentiate ecology and environment.
4. Draw and explain the process flow diagram of textile industry.
5. Outline five major pollutants of water.
6. What are waterborne diseases ? Give any *three* causative agents with the diseases caused.
7. How would you relate air pollution and climate change ?
8. What is smog ? Why does Delhi have so much smog in recent years ?
9. Suggest five measures that can be adopted to control industrial air pollution.
10. Define noise pollution and threshold of hearing. What do you mean by acceptable noise pollution ?
11. What measures can be taken for the suppression of noise at source ?
12. Convert a sound pressure of 0.015 Pa to Sound Pressure Level (decibels).
13. Draw a diagram illustrating the ion exchange process used in tertiary treatment.

Turn over

14. What are the main causes for the increase in environmental pollution of today's world ?

15. State the environmental benefits of ozonation in tertiary wastewater treatment and compare it to chlorination.

(10 × 5 = 50 marks)

Part B

Answer **one full** *question from each Section.*

Each question carries 10 *marks.*

16. (a) Explain the effect of environmental pollution on man, animal and plant life.

Or

(b) Illustrate the importance of monitoring and analysis methods in assessing the quality of industrial wastewater.

17. (a) What are the different types of waste water ? Mention the characteristics of waste water and pollution/toxic contaminants from petroleum refineries in India.

Or

(b) Write a note on the effluent treatment plant essential components at an integrated pulp and paper manufacturing plant.

18. (a) What are the sources of air pollution ? What are the ill health created to human and properties ? How to prevent ?

Or

(b) Describe different analytical procedures to collect and characterize particulate matter from effluent streams.

19. (a) Explain the construction and working principle of wet scrubber with neat sketch.

Or

(b) Is urban planning effective in controlling noise pollution ? Justify your answer. Mention some of the ways to control.

20. (a) What are the primary methods used in industrial wastewater treatment, and how do they contribute to pollution reduction and regulatory compliance ?

Or

(b) Explain the role of reverse osmosis in tertiary wastewater treatment and discuss its effectiveness in removing dissolved solids and contaminants.

(5 × 10 = 50 marks)