CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Strength of Materials-II

(Civil Engineering)

Date: 08.12.2025 FN	Time: 3 hours	Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks.   10x2=20M

1. Find the power transmitted by a 75 mm diameter shaft at 140 rpm at a maximum shear stress of 60 N/mm^2.   2 M

2. What are various types of springs?   2 M

3. Define the terms of buckling and slenderness ratio.   2 M

4. State the limitations of Euler's column theory.   2 M

5. Illustrate an example where combined direct and bending stresses occur.   2 M

6. Discuss the conditions of stability for dams.   2 M

7. How will you calculate the stress due to unsymmetrical bending?   2 M

8. What is the neutral axis in bending?   2 M

9. Distinguish between cylindrical shell and spherical shell.   2 M

10. How many types of stresses are developed in thick cylinders?   2 M

PART-B

Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). A hollow shaft with external and internal diameters of 120 mm and 80 mm respectively is to be replaced by a solid shaft of the same weight. Find the torques transmitted by the shafts if the permissible shear stress is 100MPa. If the solid shaft is replaced by a hollow shaft of 160 mm external diameter, what is the torque transmitted for the same weight of the shafts?   10M

OR

11. B). An open coiled helical spring made of 9 mm wire a mean diameter 100 mm has 15 numbers of coils, angle of helix being 10°. Determine the axial deflection and intensities of bending and shear stress under a load of 500 N. Take C= 80GPa, E= 200GPa.   10M

12. A). Derive a relation for the Euler's crippling load for a column when (i) it has both ends hinged and (ii) both ends fixed. Also obtain a relation for the Rankine's crippling load for columns.   10M

OR

12. B). Calculate the Euler's crippling load for a hollow cylindrical steel column of 38 mm external diameter and 2.5 mm thick. Take length of the column as 2.3 m and hinged at its both ends. Take E= 205 kN/mm^2. Also determine the crippling load by Rankine's formula using fc= 335 N/mm^2 and a= 1/7500.   10M

13. A). A masonry chimney 24 m high, of uniform circular section, 3.5 m external diameter and 2 m internal diameter is subjected to a horizontal wind pressure of 1 kN/m^2 of projected area. Calculate the maximum and minimum stress intensities at the base, if the specific weigh of masonry is 22 kN/m^3.   10M

(P.T.O..)

OR

13. B). A trapezoidal masonry dam is 15 m height. The dam is having water up to a depth of 12 m   10M
on its vertical side. The top and bottom width of the dam are 3.5 m and 7 m respectively.
The density of the masonry is 19.5 kN/m^3. Calculate the resultant force on the dam.

14. A). A composite beam made of steel plate (100 mm X 10 mm) welded centrally to aluminum   10M
plate (100 mm X 20 mm) is subjected to a bending moment of 2.5 kNm inclined at 30°.
Take E_{steel} = 200 GPa, $E_{aluminum}$ = 70 GPa. Calculate the location of neutral axis and the
bending stress in each material.

OR

14. B). An I- section has top flange is 100 mm X 20 mm, bottom flange is 100 mm X 20 mm and   10M
web is 10 mm X 100 mm. The beam is subjected to a bending moment of 6 kNm acting at
60° to the horizontal axis. Determine the maximum compressive and tensile stresses and
the position of neutral axis.

15. A). A thin cylindrical tube with closed ends has an internal diameter of 50 mm and a wall   10M
thickness of 2.50 mm. The tube is axially loaded in tension with a load of 10 kN and is
subjected to an axial torque of 500 Nm under an internal pressure of 6 N/mm^2. Determine
the principal stresses on the outer surface of the tube and the maximum shear stress.

OR

15. B). A compound cylinder is made by shrinkage a tube of 160 mm internal diameter and   10M
20 mm thick over another tube of 160 mm external diameter and 20 mm thick. The radial
pressure at the common surface, after shrinkage, is 8 N/mm^2. Find the final stresses set up
across the section, when the compound cylinder is subjected to an internal fluid pressure
of 60 N/mm^2.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Environmental Engineering
(Civil Engineering)

Date: 10.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries TWO marks.   **10x2=20M**

1.	What do you understand by per capita demand of water?	2 M
2.	What is mean by artesian aquifer and unconfined aquifer?	2 M
3.	Define sedimentation and explain principle of settling	2 M
4.	Distinguish between dechlorination and residual chlorine.	2 M
5.	Elaborate the following: a) BOD b) COD	2 M
6.	Give some qualities of the good sewer pipes.	2 M
7.	Define F/M ratio and sludge volume index.	2 M
8.	What are the disadvantages of trickling filters?	2 M
9.	Write a short notes on Sewage farming.	2 M
10.	Difference between aerobic digestion and anaerobic digestion.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). The following data shows variations in population of a town from 1961 to 2001. Predict   10M
the population for the year 2021, 2031, and 2041 by incremental increase method and
geometric increase method and arithmetic increase method.

Year	Population
1961	160000
1971	243000
1981	452000
1991	528000
2001	578300

OR

11. B). Derive an expression for discharge from a well fully penetrating a confined aquifer.   10M

12. A). i) Describe various methods of layout of distribution methods with neat sketches.   5M
ii) Explain Hardy Cross method of solving the network by balancing heads by correcting   5M
flow.

OR

12. B). Explain the working of slow sand filter with a neat sketch. Also mention the advantages   10M
and disadvantages slow sand filter.

(P.T.O..)

13. A). State the functions of a man-hole. Describe with the help of neat sketches the components of a man-hole.   10M

OR

13. B). i) Explain the rational method of design of storm water sewers.   5M

ii) The BOD of a sewage incubated for one day at 30°C has been found to be 100 mg/l, what will be the 5 day 20°C BOD. Assume BOD rate constant $K = 0.21$ per day at 20°C (base e).   5M

14. A). Describe the biological processes involved in the working of a trickling filter and skimming tank with the help of a neat sketch.   10M

OR

14. B). An activated sludge plant is treating an average flow of 40,000m^3/d. The TSS and BOD$_5$ of raw wastewater are 250 and 200 mg/L, respectively. The biological solids are wasted from the aeration basin at a rate of 2300 kg/d. The waste-activated sludge (WAS) is pumped to the head of primary sedimentation basin at a rate of 250m^3/d. The ratio of BOD$_5$ and TSS in waste-activated sludge is 0.43. Calculate the characteristics of combined influent stream reaching the primary basin. Also calculate the percent increase in TSS and BOD$_5$ 10M

15. A). i) For a colony of 10,000 persons having sewage flow rate of 200 L/capita/day, BOD of applied sewage of 300 mg/L and and organic loading of 300 kg/day/hectare, the area of an oxidation pond required for treating the sewage of the colony is ......?   6M

ii) What is sewage farming and their advantages?   4M

OR

15. B). i) what are the factors affecting the sludge digestion.   5M

ii) Explain the self-purification of rivers describe various zones and the dilution of sewage.   5M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Structural Analysis-I
(Civil Engineering)

Date: 12.12.2025 FN	Time: 3 hours	Max.Marks: 70

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries TWO marks.   **10x2=20M**

1.	What is a Perfect frame?	2 M
2.	Write down the assumptions made in the analysis of pin jointed frames.	2 M
3.	Write down the expression for strain energy stored due to axial force.	2 M
4.	Distinguish between Three hinged and Two hinged arches.	2 M
5.	Find out the static indeterminacy of a propped cantilever beam.	2 M
6.	Define the term Shear force.	2 M
7.	Define stiffness. How do you calculate it ?	2 M
8.	Write down the slope-deflection equations for a two span continuous beam, when the ends are fixed.	2 M
9.	Distinguish between SFD (static loads) and ILD for SF (moving loads).	2 M
10.	Sketch the ILD for Ra, SF for a simply supported beam AB of span L.	2 M

PART-B
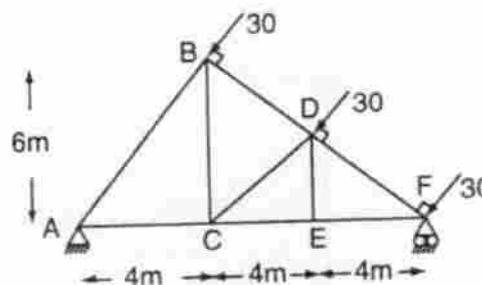Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). A truss of 4 m span is loaded as shown in Fig. 1. Find the forces in all the members of the   10M
truss by using Method of joints.
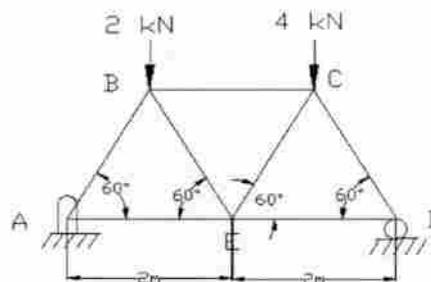
Fig. 1

OR

11. B). Find the forces in the members AC, BC & CD of the truss shown in Fig. 2 using Method   10M
of sections. All the loads are in kN.

Fig. 2

(P.T.O..)

12. A). A cantilever beam AB of span 2L is subjected to a u.d.l. of w/m through out. Find out the   10M
(i) Slope at fixed end and at free end
(ii) Deflection at fixed end and at free end using Castigliano's theorem-1.

OR

12. B). A three hinged circular arch of span 16 m and rise 4 m carries a concentrated load of 20   10M
kN at 5 m from left support. Find the (i) Reactions at the support, (ii) Maximum positive
and negative BM's.

13. A). The beam shown in Fig. 3 is fixed at one end and when unloaded there is a clearance of   10M
10 mm between the other end and the support at that end. Determine the reactions at the
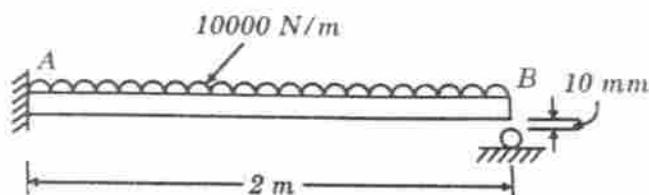supports. Take $E = 1 \times 10^7$ N.m^2

Fig. 3

OR

13. B). A fixed beam of span 4 m is subjected to an anticlockwise couple of 40 kN.m. at the mid   10M
span. The MI of left half of the beam is 2I and right half of the beam is 3I. Find out the
fixed end moments and Sketch BMD.

14. A). A continuous beam ABCD is loaded as shown in Fig. 4 below. Analyze the beam using   10M
Theorem of three moments. During loading, support B sinks by 10 mm. Take $I = 3 \times 10^7$
cm^4, $E = 2 \times 10^5$ N/mm^2.

Fig. 4
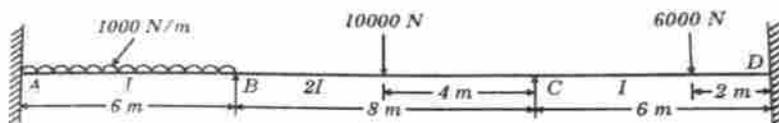
OR

14. B). A continuous beam ABCD is loaded as shown in Fig. 4 above. Analyze the beam using   10M
Slope-Deflection method. During loading, support B sinks by 20 mm.
Take $I = 3 \times 10^7$ cm^4, $E = 2 \times 10^5$ N/mm^2.

15. A). A simply supported beam of span 15 m. is subjected to a series of concentrated loads 20,   10M
30, 15 and 12 kN spaced at 2.5, 3 and 2 m respectively moving from left to right with 12
kN load leading. Determine (i) the maximum BM at 6 m. from left end, (ii) absolute
maximum BM developed in the beam.

OR

15. B). A girder bridge consists of Pratt truss shown in Fig. 5. Draw influence line diagrams for   10M
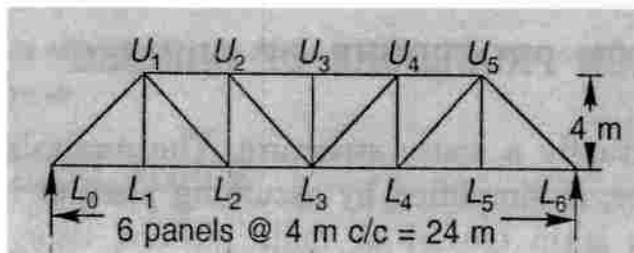the members U_1U_2, U_1L_2, L_1L_2.

Fig. 5

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Electrical Machines-II
(Electrical & Electronics Engineering)

Date: 08.12.2025 FN | Time: 3 hours | Max.Marks: 70

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	Define a single turn coil.	2 M
2.	Write the formula for the distribution factor.	2 M
3.	State the condition required to produce a rotating magnetic field.	2 M
4.	What is meant by spatial displacement of windings?	2 M
5.	What is the purpose of the circle diagram?	2 M
6.	List the different methods of starting of an induction motor.	2 M
7.	Why does a single-phase induction motor not self-starting?	2 M
8.	Mention two applications of stepper motors.	2 M
9.	What is armature reaction in synchronous machines?	2 M
10.	List any two methods of starting a synchronous motor.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Explain full-pitch and short-pitch coils with neat sketches and derive an expression for coil span factor.   10M

OR

11. B). A 4-pole, 50 Hz alternator has 48 slots and 8 conductors per slot. The flux per pole is 0.06 Wb, and the coil is short-pitched by 30 degrees. Calculate the induced emf per phase assuming a 3-phase, star connection.   10M

12. A). With neat phasor diagrams, explain how two windings displaced by 90° and fed with currents displaced by 90° produce a rotating magnetic field.   10M

OR

12. B). Compare constant, pulsating and rotating magnetic fields in terms of magnitude, direction, and time variation.   10M

13. A). With neat sketch explain the construction and working of a slip-ring induction motor.   10M

OR

13. B). Discuss various methods of starting a 3-phase induction motor.   10M

14. A). Explain the construction and working principle of a single-phase induction motor.   10M

OR

14. B). Explain the construction, working, and characteristics of an AC series motor.   10M

15. A). Explain the construction and working principle of a cylindrical rotor synchronous machine.   10M

OR

15. B). Explain the parallel operation of alternators and the conditions for synchronization.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Network Theory-II
(Electrical & Electronics Engineering)

Date: 10.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   **10x2=20M**

1.	Define phase sequence in a three-phase system.	2 M
2.	State the relation between line and phase voltages and currents in a star connection.	2 M
3.	Define transient response.	2 M
4.	State the time constant of an RL circuit.	2 M
5.	Differentiate between driving point function and transfer function.	2 M
6.	List any two properties of network functions.	2 M
7.	Define z-parameters.	2 M
8.	Define pass band and stop band.	2 M
9.	State Fourier theorem.	2 M
10.	Write the expression for exponential form of Fourier series.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). Derive the relation between line and phase quantities in delta connection with phasor   10M
diagrams.

OR

11. B). An unbalanced 3-phase, 4-wire star-connected load has impedances of $Z_1 = 10\angle 0°$, $Z_2 =$ 10M
$15\angle 30°$, and $Z_3 = 20\angle-45°$. Calculate the line currents and neutral current for a 400 V,
3-phase, 50 Hz supply.

12. A). Derive the Transient Response of series RL-circuit with D.C excitation.   10M

OR

12. B). A series RC circuit consists of resistor of 10Ω and capacitor of 0.1F has a constant   10M
voltage of 20V is applied to the circuit at t=0.obtain the current equation. Determine the
voltage across the resistor and the capacitor.

13. A). Explain the properties of the Driving point functions and transfer functions.   10M

OR

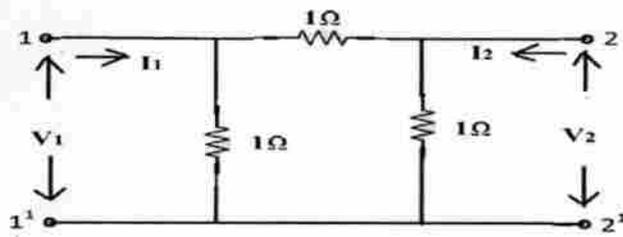13. B). Determine the driving-point impedance of the network shown in Fig.   10M
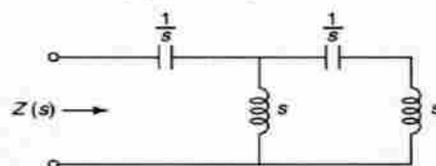
(P.T.O..)

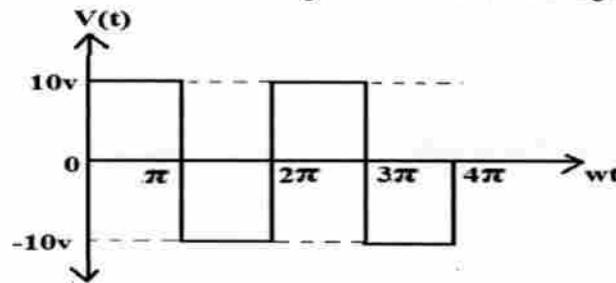14. A). Find the Y-parameters of the network shown in below figure. 10M

OR

14. B). Explain the design and characteristics of a low-pass filter using T-network. 10M

15. A). Obtain the Fourier series for the following waveform shown in figure. 10M

OR

15. B). Write and prove the properties of Fourier transforms. 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Switching Theory & Logic Design

(Electrical & Electronics Engineering)

Date: 19.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	Solve $(AD012)16 = (X)5$.	2 M
2.	What are universal gates? Why they are called universal gates?	2 M
3.	Realize full adder using half adders.	2 M
4.	List various types of ROM.	2 M
5.	Distinguish between combinational and sequential circuits.	2 M
6.	Draw the symbol of clocked JK flip-flop and its truth table.	2 M
7.	Compare synchronous and Asynchronous counters.	2 M
8.	Illustrate various types of shift registers.	2 M
9.	List the limitations of FSM.	2 M
10.	State the difference between conventional flow chart and ASM chart.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). What are logic gates? Explain about different logic gates i) OR gate ii) AND gate   10M
iii) NAND gate iv) NOR gate and v) X-OR gate.

OR

11. B). The binary numbers listed have a sign bit in the left most position and, if negative   10M
numbers are in 2's complement form. Perform the arithmetic operations indicated and
verify the answers.
(i) $101011 + 111000$ (ii) $001110 + 110010$ (iii) $111001 - 001010$ (iv) $101011 - 100110$

12. A). i) Explain the operation of carry look-a-head adder with neat sketches.   5M
ii) Design a 32:1 multiplexer using two 16:1 and 2:1 multiplexers.   5M

OR

12. B). Show how these functions can be implemented on a PLA having an 8*8 AND array and a   10M
4X8 OR array.
$F1(A,B, C,D) = \Sigma m\ (2, 3, 6, 7, 11, 15)$; $F2(A,B, C,D) = \Sigma m\ (0, 4, 8, 9, 11, 15)$;
$F3(A,B,C,D) = \Sigma m\ (1,3,5,7,10,11)$; $F4(A,B,C,D) = \Sigma m\ (0, 2, 4, 6, 8, 9, 11, 12, 13, 15)$

13. A). Construct and explain the operation of SR flip flop using truth table and excitation table.   10M

OR

13. B). What is an excitation table? Write the excitation tables for JK and T flip-flops.   10M

(P.T.O..)

14. A). Reduce the number of states in the following state table and tabulate the reduced state   10M
table shown below:

Present state	Next state		Output	
	$x = 0$	$x = 1$	$x = 0$	$x = 1$
a	f	b	0	0
b	d	c	0	0
c	f	e	0	0
d	g	a	1	0
e	d	c	0	0
f	f	b	1	1
g	g	h	0	1
h	g	a	1	0

OR

14. B). Draw the circuit diagram of MOD-10 Counter and explain the operation of it.   10M

15. A). Draw the circuit for Moore type FSM. Convert the given mealy machine to Moore   10M
machine by using transition diagram.

State	input		output
	a	b	
A	B	A	0
B	B	C	0
C	B	D	0
D	B	A	1

OR

15. B). With the help of State table and State diagram explain the operation of Sequence   10M
generator with an example.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Fluid Mechanics & Hydraulic Machines
(Mechanical Engineering)

Date: 08.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	Show the relationship between Absolute, Gauge, Atmospheric and vaccum pressures with neat sketch.	2 M
2.	How does viscosity of a fluid vary with temperature?	2 M
3.	What is the working principle of pitot-tube and its use?	2 M
4.	Differentiate between steady and unsteady flow.	2 M
5.	List out any four minor losses and write formulae.	2 M
6.	Define a compound pipe? What will be the loss of head when pipes are connected in series.	2 M
7.	What is the purpose of drawing velocity triangles?	2 M
8.	Differentiate between impulse and reaction turbines.	2 M
9.	What is cavitation and its effects?	2 M
10.	How do you classify reciprocating pumps?	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). i) Define viscosity, kinematic viscosity and write the units and dimensional formulae. **4M**

ii) Find the Kinematic viscosity of an oil having density 981 kg/m^3. The shear stress at a point in oil is 0.2452 N/m^2 and velocity gradient at that point is 0.2 per second. **6M**

OR

11. B). A U-tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetrachloride having a specific gravity 1.594 under a pressure of 11.772 N/cm^2 and pipe B contains oil of specific gravity 0.8 under a pressure of 11.772 N/cm^2. Pipe A lies 2.5 m above pipe B. Find the difference of pressure measured as fluid filling U-tube. **10M**

12. A). Derive Euler's equation of motion along a stream line and then derive Bernoulli's equation. State assumptions also. **10M**

OR

12. B). i) A 300mm diameter pipe conveying water branches into two pipes of diameter 250mm and 200mm respectively. If the average velocities in the 300mm and 200mm pipes be 2.5m/s and 1 m/s. Calculate the velocity in the 250mm pipe. **6M**

ii) Explain briefly about stream line, path line, streak line and stream tube. **4M**

13. A). A pipeline ABC 180 m long is laid on an upward slope of 1 in 60. The length of the portion AB is 90 m and its diameter is 0.15 m. At 'B' the pipe section suddenly enlarges to 0.30 m diameter and remains so for the remainder of its length BC, 90 m. A flow of 50 liters per second is pumped into the pipe at its lower end A and is discharged at the upper end C into a closed tank. The pressure at the supply end A is 137.34 kN/m^2. Sketch (a) the total energy line, (b) the hydraulic grade line and also find the pressure at the discharge end C. Take f= 0.02. **10M**

(P.T.O..)

13. B). What do you mean by separation of boundary layer? Explain briefly the effect of pressure   10M
gradient on boundary layer separation with neat sketch.

14. A). A reaction turbine works at 460 rpm under a head of 110 metres. Its diameter at inlet is   10M
1150 mm and the flow area is 0.03 m². The angles made by the absolute velocity and
relative velocity at inlet are respectively 18^0 and 50^0 with the tangential velocity.
Determine (i) The volume flow rate (ii) The power developed (iii) The efficiency. Assume
whirl at outlet to be zero.

<div align="center">OR</div>

14. B). Explain characteristic curves of hydraulic turbines.   10M

15. A). i) Explain the terms manometric efficiency, mechanical efficiency and overall efficiency   6M
as applied to centrifugal pumps.

ii) Explain the term negative slip as used in connection with the working of a   4M
reciprocating pump. Why and when negative slip occurs?

<div align="center">OR</div>

15. B). A single acting reciprocating pump has a cylinder of diameter 150 mm and stroke length   10M
300 mm. The centre of the pump is 4 m above the water surface in the sump. The
atmospheric pressure head is 10.3 m of water and pump is running at 40 rpm. If the length
and diameter of the suction pipe are 5 m and 10 cm respectively, determine the pressure
head due to acceleration in the cylinder (i) At the beginning of the suction stroke (ii) In
the middle of suction stroke.

<div align="center">*****</div>

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Applied Thermodynamics
(Mechanical Engineering)

Date: 09.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	Define: (a) stroke volume (b) clearance volume.	2 M
2.	State the functions of carburettor in petrol engine.	2 M
3.	What are the harmful effects of overheating of an engine?	2 M
4.	What is meant by anti knock additives and its significance?	2 M
5.	What are the various methods for measurement of friction power?	2 M
6.	Define:(a) Indicated mean effective pressure (b) Indicated power.	2 M
7.	List the advantage of multistage compressor over single stage compressor.	2 M
8.	What is compressor? Classify the compressors.	2 M
9.	Write down the applications of air refrigeration system.	2 M
10.	State merits and demerits of vapour compression system over air refrigeration system.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). With a neat diagram explain the working principle of a four stroke CI engine.   10M

OR

11. B). With a neat diagram explain the working of a Battery coil ignition system.   10M

12. A). i) Discuss the effect of various engine variables on CI engine knock.   5M
ii) Describe the following types of combustion chambers   5M
(a) Overhead valve type combustion chamber (b) F-head type combustion chamber.

OR

12. B). Explain the stages of combustion in C.I.engine along with p-θ diagram.   10M

13. A). The following data was recorded during testing of a four stroke cycle gas engine. Area of   10M
indicator diagram = 900 mm^2 ; Length of indicator diagram = 70 mm; spring scale = 0.3
bar/mm; Diameter of piston = 200 mm; Length of stroke = 250 mm; Speed = 300 rpm.
Determine a) Indicated mean effective pressure b) Indicated power.

OR

13. B). During a test on a diesel engine the following observations were made: The power   10M
developed by the engine is used for driving a D.C. generator. The output of the generator
was 210 A at 200V; the efficiency of generator being 82%. The quantity of fuel supplied
to the engine was 11.2 kg/h; calorific value of fuel being 42600kJ/kg. The air-fuel ratio
was 18:1. The exhaust gases were passed through a exhaust gas calorimeter for which the
observations were as follows: Water circulated through exhaust gas calorimeter =
580 liters/hr. Temperature rise of water through calorimeter=36^{0}C. Temperature of
exhaust gases at exit from calorimeter=98^{0}C. Ambient temperature=20^{0}C. Heat lost to
jacket cooling water is 32% of the total heat supplied. If the specific heat of exhaust gases
be 1.05kJ/kg K. Draw up the heat balance sheet on minute basis.

(P.T.O..)

14. A). Derive the expression for the volumetric efficiency of a reciprocating air compressor in terms of clearance ratio, pressure ratio and index of the compression.   10M

OR

14. B). With the help of a neat sketches explain the working of centrifugal air compressor clearly discussing how the pressure changes take place in impeller and diffuser.   10M

15. A). A simple vapour compression plant produces 5 tonnes of refrigeration. The Enthalpy values at inlet to compressor, at exit from the compressor, and at exit from the condenser are 183.19, 209.41 and 74.59 KJ/Kg respectively. Estimate (i) The refrigerant flow rate (ii) The C.O.P, (iii) The power required to drive the compressor and (iv) The rate of heat rejection to the condenser.   10M

OR

15. B). Explain Briefly an air refrigeration system working on reversed Carnot cycle. Derive expression for its C.O.P.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Manufacturing Processes
(Mechanical Engineering)

Date: 10.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	Define permeability number and write the mathematical formulae.	2 M
2.	Define the term riser and mention its uses.	2 M
3.	What is the cold forging and its applications?	2 M
4.	Identify some common surface treatments for sheet metal?	2 M
5.	What is rake angle? Explain its function.	2 M
6.	Write the Taylors Tool life equation.	2 M
7.	Write the difference between welding and fitting.	2 M
8.	What is the purpose of using a flux in brazing?	2 M
9.	What is unconventional machining process write an example?	2 M
10.	What are the machining parameters in unconventional machining process?	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	What are the properties of molding sand write them in detail.	10M
	OR	
11. B).	Define Pattern and list out the pattern materials.	10M
12. A).	Explain the concept of "roll bite" and its influence on the rolling process.	10M
	OR	
12. B).	A hole of 10 mm X 25 mm is to be cut in a 3 mm thick sheet. The shear strength of the material is 80 MPa. Estimate the press load required.	10M
13. A).	Sketch the terminology of single point cutting Tool with neat diagram.	10M
	OR	
13. B).	Define Tool Wear? and what are the types of Tool Wear.	10M
14. A).	Describe the different types of additive manufacturing processes.	10M
	OR	
14. B).	Discuss the applications of additive manufacturing in various industries.	10M
15. A).	What are the requirements that lead to the development of Unconventional machining process.	10M
	OR	
15. B).	Write the working principle of Ultrasonic machining process with Diagram.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Kinematics of Machinery
(Mechanical Engineering)
Date: 19.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	When does a kinematic chain become a (i) Structure, (ii) Incompletely constrained and (iii) Redundant.	2 M
2.	Define Grubler's criterion for a mechanism.	2 M
3.	What is relative velocity with respect to link?	2 M
4.	Define Klein's construction.	2 M
5.	What is the main advantage of the Hart mechanism over the Peaucellier mechanism?	2 M
6.	What is pantograph? How does it differ from a straight-line motion mechanism?	2 M
7.	Define Cam and explain its use.	2 M
8.	What are the types of followers used in cam mechanisms?	2 M
9.	Define contact ratio in gears. Write its significance.	2 M
10.	What are 'Idler gears'? When are they used?	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Describe, with a neat sketch, the rotary engine mechanism as an inversion of single slider crank chain.   10M

OR

11. B). In a crank and slotted lever mechanism, the driving crank is 35 mm long, and the time ratio of cutting stroke to return stroke is 1.6. If the length of working stroke of the ram is 110 mm, find the distance between the fixed centers, and the slotted lever length.   10M

12. A). In a four bar chain ABCD, link AD is fixed and the crank AB rotates at 10 radians per second clockwise. Lengths of the links are AB=60mm, BC=CD=70mm, DA=120mm. when angle DAB=60^0 and both B and C lie on the same side of AD, find 1) angular velocities (magnitude and direction) of BC and CD. 2) Angular acceleration of BC and CD.   10M

OR

12. B). In a slider crank mechanism, the length of crank OB and connecting AB are 125mm & 500mm respectively. The centre of gravity 'G' of the connecting rod is 275mm from the slider A. the crank speed is 600rpm clockwise when the crank has turned 45^0 from the IDC position, determine: 10M
  i) Velocity of the slider A
  ii) Velocity of the point G, and
  iii) Angular velocity of the connecting rod AB.

(P.T.O..)

13. A). Draw a neat sketch of the Davis steering gear and derive the condition for correct steering. 10M

OR

13. B). In Hart's mechanism, derive the condition for producing an exact straight line motion. 10M

14. A). A cam rotating in clockwise direction at a uniform speed of 1000 rpm is required to give a 10M
roller follower the motion defined below:
- o Follower moves outwards through 50 mm during 120° of cam rotation
- o Follower dwells for next 60° of cam rotation
- o Follower returns to its original position during next 90° of cam rotation
- o Follower dwells for rest of the cam rotation

The minimum radius of the cam is 50 mm, and the diameter of roller is 10 mm. The line
of stroke of follower is off-set by 20 mm from the axis of the camshaft. If the
displacement of the follower is to take place with SHM on both strokes, draw the profile
of the cam. Also determine the maximum velocity and acceleration during outwards and
return strokes.

OR

14. B). A cam drives a flat reciprocating follower in the following manner: During first 120^0 10N.
rotation of the cam, follower moves outwards through a distance of 20 mm with SHM.
The follower dwells next 30^0 of cam rotation. During next 120^0 of cam rotation, the
follower moves inwards with SHM. The follower dwells for the next 90^0 of cam rotation.
The minimum radius of the cam is 25 mm. Draw the profile of the cam.

15. A). i) Two mating spur gears have 24 and 30 teeth, a standard addendum of one module, and 5M
a pressure angle of 20^0. Find the length of the arc of contact in terms of the circular pitch.
ii) Derive the expression for the velocity ratio of a compound gear train. 5M

OR

15. B). In a reverted epicycleic gear train, the arm A carries two gears B and C, and a compound 10M
gear D – E. The gear B meshes with gear E, and the gear C meshes with gear D. The
number of teeth on gears B, C, and D are 75, 30, and 90 respectively. Find the speed and
direction of gear C when the gear B is fixed and the arm A makes 100 rpm clockwise.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Signals & Systems

(Common for EEE & ECE)

Date: 06.12.2025 FN	Time: 3 hours	Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	What are the basic signal operations?	2 M
2.	What is an even component of sin(t) and cos(t)?	2 M
3.	Write the frequency-shifting property of Fourier Transform.	2 M
4.	What is the use of anti-aliasing filter?	2 M
5.	What is the difference between LTI & LTV systems?	2 M
6.	Define Causal system.	2 M
7.	Define Power Spectral Density	2 M
8.	What is correlation?	2 M
9.	Determine LT of u(t) signal.	2 M
10.	Write Z-transform of $a^n u(-n-1)$	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	i) Derive the relationship between exponential Fourier series coefficients and Trigonometric Fourier Series coefficients.	6M
	ii) State Dirichlet's conditions for existence of Fourier Series.	4M

OR

11. B).	Express function f(t) in terms of another function x(t) using signal approximation and derive the condition for orthogonality.	10M

12. A).	State and prove time differentiation and frequency domain convolution properties of Fourier Transform	10M

OR

12. B).	i) State and prove sampling theorem for band limited signals.	6M
	ii)What is the effect of under sampling while reconstruction of original signal? How to overcome these effects.	4M

13. A).	Derive relation between rise time and band width.	10M

OR

13. B).	i) Derive the necessary conditions for distortion less transmission through LTI systems.	5M
	ii) Explain ideal filter characteristics.	5M

14. A).	i) Explain the detection of periodic signals in the presence of noise using Correlation.	6M
	ii) Compute convolution of $x(t)=e^{-t} u(t)$ and h(t) = u(t).	4M

OR

14. B).	Derive the relation between autocorrelation and power spectral density. And also list the properties of PSD.	10M

(P.T.O..)

15. A). i) Determine the Laplace Transform of $x(t)=e^{-a|t|}u(t)$. 6M
ii) State and prove initial value theorem for Laplace transforms 4M

OR

15. B). i) State and prove linearity and time reversal property of z transform 6M
ii) Find the z transform of $2^{-n}u(n)$ and $-(1/2)^{n}u(-n-1)$ 4M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Electronic & Pulse Circuits
(Electronics & Communication Engineering)

Date: 08.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	List out different types of coupling used in multistage amplifiers.	2 M
2.	What is effect of negative feedback on amplifier gain?	2 M
3.	List various hybrid π capacitances of a BJT.	2 M
4.	How does the presence of capacitors affect the low-frequency response of a BJT amplifier?	2 M
5.	What are the advantages of push-pull configuration?	2 M
6.	What is the effect of distortion on the output signal of a power amplifier?	2 M
7.	Write the expression for the output voltage of a Highpass RC circuit if a pulse signal of voltage V is applied as input.	2 M
8.	Define Clamping circuit theorem.	2 M
9.	What is the difference between Astable Multivibrator and Monostable Multivibrator?	2 M
10.	List the applications of Astable Multivibrator.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Interpret the expression for input resistance of a Darlington pair circuit.   10M

OR

11. B). Analyze the current series feedback amplifier for the expressions of input & output impedances with a neat circuit diagram.   10M

12. A). Identify A_I, R_i, R_o and A_V In a single stage CE amplifier R_S=1 KΩ, R_1=50 KΩ, R_2=2 KΩ, R_C=1 KΩ, R_L=1.2 KΩ, h_{fe}=50 and h_{ie}=1.1KΩ.   10M

OR

12. B). Develop an expression for CE short-circuit current gain with resistive load.   10M

13. A). Explain the operation of transformer coupled class-A power amplifier with a neat circuit diagram.   10M

OR

13. B). Explain about Thermal stability and Heat sinks.   10M

14. A). Explain the response of an RC low-pass circuit to a square wave input for long, medium and short time constants.   10M

OR

14. B). Construct a two level clipping for bias voltages V_1 = 5V and V_2= -5V . Use practical diodes.   10M

(P.T.O..)

15. A). Identify the following: 10M

        (i) Plot to scale the wave shapes at each base and collector.

        (ii) Width of the output pulse

        A collector coupled Monostable multivibrator using n-p-n silicon transistors has the following parameters: $V_{CC} = 12V$, $V_{BB} = 3V$, $RC = 2k$, $R_1 = R_2 = R = 20k$ $h_{FE} = 30$, $r_{bb} = 200\Omega$, and $C = 1000$ PF. Neglect I_{CBO}.

OR

15. B). Derive the expression for the frequency of oscillation of an Astable multivibrator.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Analog & Digital Communications

(Electronics & Communication Engineering)

Date: 09.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	Define Modulation.	2 M
2.	List the advantages and dis-advantages of SSB-SC modulation.	2 M
3.	Draw the waveform of Frequency Modulated signal.	2 M
4.	Differentiate between AM and FM.	2 M
5.	What are the draw backs in Delta Modulation?	2 M
6.	Draw the block diagram of TDM.	2 M
7.	Compare all modulation techniques(any two parameters).	2 M
8.	Give the signal space representation of a QAM signal.	2 M
9.	Define entropy in the context of information theory.	2 M
10.	What is meant by source coding?	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Derive the expression of AM in time domain and frequency domain representation with necessary waveforms.   10M

OR

11. B). With a neat block diagram explain Ring modulator method of generating DSB-SC and coherent detection of DSB-SC.   10M

12. A). Describe how a Balanced slope detector is used for FM demodulation.   10M

OR

12. B). Explain how FM signal is generated indirectly.   10M

13. A). Describe PWM modulator and demodulator   10M

OR

13. B). Construct DPCM transmitter and receiver.   10M

14. A). Explain QPSK with waveforms, constellation diagram and mathematical representation.   10M

OR

14. B). Explain the coherent detection of FSK signals and derive the expression for probability of error.   10M

15. A). A discrete memory less source has five symbols X_1, X_2, X_3, X_4 and X_5 with probabilities 0.4, 0.19, 0.16, 0.15, 0.15 respectively. Construct a Shannon–Fano code for the source and calculate the code efficiency η.   10M

OR

15. B). An analog signal is band limited to B Hz and sampled at Nyquist rate. The samples are quantized into 4 levels. Each level represents one message. The probability of occurrence of these 4 levels are $P_1 = P_4 = 1/8$ and $P_2 = P_3 = 3/8$.   10M
i) Calculate the entropy and information rate of the source. ii) Calculate the entropy and information rate of the source if all the messages are equally likely.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Electro Magnetic Waves & Transmission Lines

(Electronics & Communication Engineering)

Date: 10.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	Define Infinitesimal volume element in spherical polar coordinates	2 M
2.	Write the different coordinate systems.	2 M
3.	State Ampere's circuital law.	2 M
4.	What are boundary conditions?	2 M
5.	Distinguish between conduction current and displacement current?	2 M
6.	State Faraday's law	2 M
7.	Define Propagation constant.	2 M
8.	Write the condition for distortion less line.	2 M
9.	Define primary and secondary Constants.	2 M
10.	Define reflection coefficient.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Give the Cartesian coordinates of the point $C(\rho = 4, \phi = -650, z = 2)$. Give the cylindrical   10M
coordinates of the point $D(x = -3.1, y = 2.6, z = 3)$. Specify the distance from C to D.

OR

11. B). i) Find the div D at the Point $P(2, 3, -1)$ if $D = (2xy - y^2)az + (^{x2z} - 2xy)ay + x^2 yaz$ C/m^2.   5M
ii) Given vectors $M = -10ax + 4ay - 8az$ and $N = 8ax + 7ay + -2az$. Find (a) Unit   5M
vector indirection $-M + 2N$ (b) Magnitude of $5az + N - 3M$.

12. A). From the Biot savarts law obtain the expression for magnetic field intensity and vector   10M
potential at a point P and distance R from infinitely long straight current carrying
conductor.

OR

12. B). Derive the boundary conditions for the normal and tangential components of magnetic   10M
field at the interface of two different media.

13. A). Derive the wave equations for electric and magnetic fields.   10M

OR

13. B). From Maxwell's equation, derive the electromagnetic wave equation in conducting and   10M
non-conducting medium for E and H fields.

14. A). Derive the general solutions of transmission line for voltage and current at any point on a   10M
line.

OR

14. B). Obtain the expressions for current and voltage at any point along a line, which is   10M
terminated in its Characteristic impedance.

15. A). Derive the expressions for the input impedance of the transmission line. Deduce the input   10M
impedance of open and short circuited transmission less line.

OR

15. B). Derive the expression for single stub matching.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Control Engineering

(Electronics & Communication Engineering)

Date: 19.12.2025 FN	Time: 3 hours	Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1.	What are the various control system classifications?	2 M
2.	Write the force balance equation of ideal spring element.	2 M
3.	Draw the speed-torque characteristics of AC servomotor.	2 M
4.	What is the use of Mason's gain formula?	2 M
5.	State limitations of Routh's stability.	2 M
6.	Define steady state error.	2 M
7.	Define Gain margin.	2 M
8.	What are the frequency domain specifications?	2 M
9.	Write the formula for solutions of state equation?	2 M
10.	Define controllability and observability.	2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

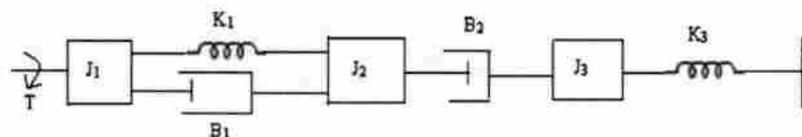11.A). Write the differential equations governing the mechanical system shown in the figure and determine the transfer function.   10M
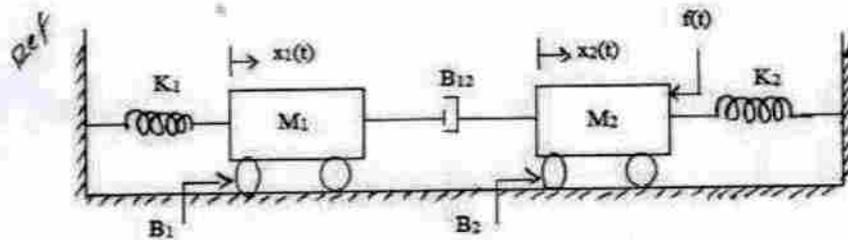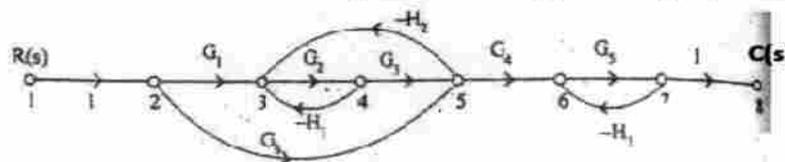

OR

11. B). Write the differential equations governing the mechanical rotational system shown in the figure and determine the transfer function.   10M

12. A). Find the overall transfer function of the system whose signal flow graph is shown below.   10M

(P.T.O..)

12. B). Derive an expression for the transfer function of an field controlled and Armature Controlled DC servo motor.   10M

13. A). Derive the expression for transient response of a under damped second order system with unit step input and draw the response curve.   10M

13. B). Sketch the root locus for open loop transfer function in unity feedback system is given below, $G(s) = K/(S^2+4S+13)$.   10M

14. A). The open loop transfer function of unity feedback system is given by $G(S) = 1/S^2(1+S)(1+2S)$. Sketch the polar plot and determine the Gain margin and Phase margin.   10M

14. B). Sketch the Bode plot for the following transfer function and determine the system gain K for the gain cross over frequency to be 5 rad/sec. $G(S) H(S)= KS^2/(1+0.2S)(1+0.02S)$.   10M

15. A). i) Define state, state variable, state equation.   5M

ii) Obtain the state transition matrix for the state model whose matrix A is given by   5M

$$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$

15. B). State whether the system is controllable and observable for the linear time invariant system characterized by the state model: 10M

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 2 & -3 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u, Y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}.$$

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Design & Analysis of Algorithms

(Common for CSE, IT, CSM, AID & AIM)

Date: 08.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

**Each question carries TWO marks.**   10x2=20M

1.	What are the characteristics of an algorithm?	2 M
2.	Differentiate between time and space complexity.	2 M
3.	State the principle of Divide and Conquer.	2 M
4.	Write steps of Dynamic Programming.	2 M
5.	Differentiate between backtracking and branch & bound.	2 M
6.	What is a Hamiltonian cycle?	2 M
7.	What is a Spanning Tree?	2 M
8.	List applications of the Network Flow Algorithm.	2 M
9.	What is NP-Complete?	2 M
10.	Is Chromatic number decision problem is NP-Hard? Justify.	2 M

PART-B

Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). i) Explain the characteristics and performance measurement of an algorithm.   5M

ii) Find Big-Oh Notation and Omega Notation for $f(n)=7n^3+50n^2+200$.   5M

OR

11. B). Solve the recurrence relation using Substitution and Master's theorem.   10M

$T(n)=2T(n/2)+O(n)$ if n>1

1   if n=1

12. A). Apply Dynamic Programming to solve the Matrix Chain Multiplication problem.   10M

OR

12. B). i) Explain Divide and Conquer strategy with Merge Sort.   5M

ii) Solve the following instance of 0/1 Knapsack problem using Greedy. n = 3; (W1, W2,   5M
W3) = (3, 5, 7); (P1, P2, P3) = (3, 7, 12); M = 4.

13. A). Explain the Backtracking approach with N-Queens problem.   10M

OR

13. B). Compare Backtracking and Branch and Bound strategies with examples.   10M

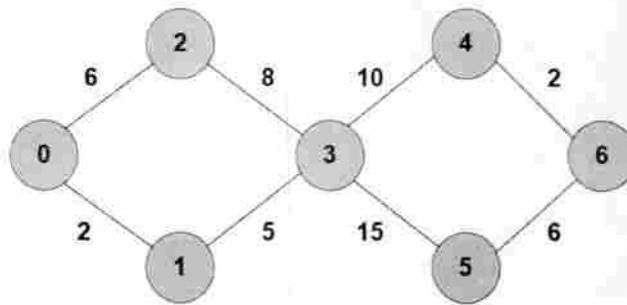14. A). Explain BFS & DFS algorithms and also find BFS & DFS for the given below graph.   10M
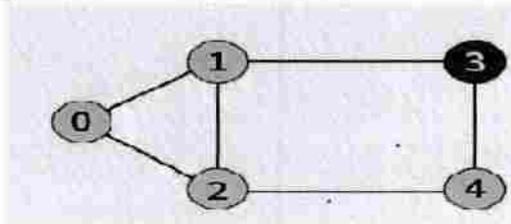
14. B). Implement and trace Dijkstra's shortest path algorithm for the below graph.   10M

15. A). Define and differentiate between P, NP, NP-Complete, and NP-Hard classes.   10M

15. B). Apply reduction techniques to prove NP-completeness of problems.   10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Software Engineering

(Common for CSE & IT)

Date: 09.12.2025 FN	Time: 3 hours	Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries TWO marks.   10x2=20M

1.	What are the key characteristics of Agile process models?	2 M
2.	Define the Capability Maturity Model Integration (CMMI).	2 M
3.	What is the purpose of a Software Requirements Document (SRD)?	2 M
4.	What is requirements elicitation and analysis?	2 M
5.	What are the key elements of the design model?	2 M
6.	Distinguish architectural design styles and patterns.	2 M
7.	What is the difference between black-box and white-box testing?	2 M
8.	What is validation testing and system testing?	2 M
9.	Define risk management and why is it important in software development.	2 M
10.	What is software quality assurance and why is it important?	2 M

PART-B

Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).	Explain different types of process models, including waterfall, incremental, and evolutionary models.	10M

OR

11. B).	Describe the Unified Process and its key characteristics.	10M
12. A).	Discuss the importance of requirements management and describe its key activities.	10M

OR

12. B).	List and explain different types of system models, including context models, behavioral models, and data models.	10M
13. A).	Discuss the importance of architectural design and describe different architectural design styles.	10M

OR

13. B).	Explain the key elements of UML, including class diagrams, sequence diagrams, and collaboration diagrams.	10M
14. A).	Discuss the importance of test planning and test execution.	10M

OR

14. B).	Describe the different types of product metrics, including metrics for analysis model, design model, and source code.	10M
15. A).	Discuss the reactive and proactive risk strategies and describe their key activities.	10M

OR

15. B).	Explain the key elements of software quality management, including software quality assurance and software reviews.	10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025

Course Name: Machine Learning

(CSM)

Date: 06.12.2025 FN   Time: 3 hours   Max.Marks: 70

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1. What is regression in machine learning? Give an example.   2 M
2. Define the Vapnik-Chervonenkis (VC) dimension and highlight its significance in machine learning.   2 M
3. Explain Bayesian decision theory.   2 M
4. What is bias and variance dilemma?   2 M
5. How does subset selection contribute to dimensionality reduction in machine learning models?   2 M
6. Given a dataset with varying cluster densities, explain how you would determine the optimal number of clusters using the Elbow Method.   2 M
7. Outline decision tree pruning and its effect on improving the performance of a decision tree model.   2 M
8. Define lineal discrimination analysis. Give an example.   2 M
9. How can a perceptron model be used to implement the logical AND operation, and what are the key weights and thresholds required for this task?   2 M
10. What is multi-layer perception? Draw an architecture of MLP.   2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Analyze the benefits and limitations of three types of machine learning and explain with example.   10M

OR

11.B). Suppose you are tasked with designing a system to identify junk emails. What specific features in an email can indicate that it is junk? How can a computer use syntactic analysis to detect such emails? Once a junk email is identified, what action would you prefer the system to take—automatically delete it, move it to a separate folder, or simply highlight it on the screen?   10M

12.A). Discuss the Naïve Bayes classification method and explain how it can be used to predict the class of a new example with the attributes: Refund = No, Marital Status = Married, Taxable Income = 120k, based on the provided training data in the following table.   10M

Tid	Refund	Marital Status	Taxable Income	Evade
1	Yes	Single	125K	No
2	No	Married	100K	No
3	No	Single	70K	No
4	Yes	Married	120K	No
5	No	Divorced	95K	Yes
6	No	Married	60K	No
7	Yes	Divorced	220K	No
8	No	Single	85K	Yes
9	No	Married	75K	No
10	No	Single	90K	Yes

(P.T.O..)

12. B). Define the K-Nearest Neighbor (KNN) classification method and discuss the details of the   10M
model with relevant equations.

13. A). Explain the process of Principal Component Analysis (PCA) for dimensionality reduction.   10M
Discuss the key steps involved in PCA, including how eigenvectors and eigenvalues are
used to determine the principal components. Also, describe Linear Discriminant Analysis
(LDA) and its use in supervised dimensionality reduction. Compare the advantages and
limitations of PCA and LDA.

13. B). Describe two cases where K-Means clustering fails to give good results. Show pictorially   10M
a two-dimensional data space where K-Means cluster analysis fails.

14. A). Why do overfitting occur in decision trees? Give a technique to solve overfitting and   10M
illustrate the same with an example tree.

14. B). Build a decision tree for the following training data listed in table using ID3 algorithm.   10M
Show each step of the computation and furnish information gain of attributes in the table
form.

GPA	Studied	Location	Passes
high	false	Hostel	No
high	false	Stayed out	No
medium	false	Hostel	No
Low	true	Hostel	Yes
medium	true	Stayed out	Yes

15. A). Analyze the structure and significance of Multilayer Perceptrons (MLP) in neural network   10M
architectures. Evaluate the implications of the Universal Approximation Theorem,
detailing how MLPs can approximate any continuous function under specific conditions.
Demonstrate the working of the Backpropagation algorithm used for training MLPs,
including the steps for computing gradients and updating weights.

15. B). Compare and contrast the ensemble learning techniques of Bagging and Boosting. Explain   10M
the key differences in their approaches, how they contribute to improving the performance
of individual base learners. Provide examples to illustrate their applications.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Numerical Techniques & Probability Distributions
(Common for CE, ME, CSE, IT, CSC, CSD)

| Date: 06.12.2025 FN | Time: 3 hours | Max.Marks: 70 |

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries TWO marks.   10x2=20M

1. Find the first approximation of the root of the equation $x^3 - x - 4 = 0$ by regula- falsi   2 M
   method that lies between 1 and 2.

2. Use Lagrange's interpolation to find the value $f(4)$ from the given data: 2 M

X	0	-1	1
$f(x)$	1	2	3

3. State the Simpson's 3/8 Rule formula.   2 M

4. Write the Taylor's series for solution of the equation $\frac{dy}{dx} = f(x, y)$, $y(x_0) = y_0$ 2 M

5. Find $L\{1 + \cos 2t\}$.   2 M

6. Find $L^{-1}\left\{\frac{s^2 - 3s}{s^3}\right\}$.   2 M

7. What are the types of random variables?   2 M

8. State the poisson distribution and give its constants.   2 M

9. Write the formula of test statistic for difference of proportions of large samples.   2 M

10. Write the application of the chi-square distribution.   2 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A).   i) Find an approximate value of the real root of $x^3 - 4x - 9 = 0$ using Bisection method   5M
         correct to three decimal places.

         ii) Find the root of $x^3 - 3x + 1 = 0$ correct to three decimal places using Newton-   5M
         Raphson method.

OR

11. B).   The table gives the distance in nautical miles of the visible horizon for the given heights   10M
          in feet above the earth's surface:

X = height	100	150	200	250	300	350	400
Y=distance	10.63	13.03	15.04	16.81	18.42	19.90	21.27

          Find the values of y when (i) x = 218 ft   (ii) x = 370 ft

12. A).   i) Use the Trapezoidal rule to evaluate $\int_0^1 \frac{dx}{1+x^2}$.   5M

          ii) Use Simpson's $\frac{1}{3}$ rule to estimate the integral $\int_0^1 \frac{dx}{x+1}$ by taking 6 intervals.   5M

OR

12. B).   By using Runge-Kutta method of fourth order, find the value of y at x = 0.4, taking h =   10M
          0.2, given that $\frac{dy}{dx} = \frac{y+x}{y-x}$, $y(0) = 1$.

(P.T.O..)

13. A). i) Find $L\{t\,e^{-2t}\sin 2t\}$ 5M

    ii) Find $L\left[\left(\sqrt{t}-\dfrac{1}{\sqrt{t}}\right)^{3}\right]$ 5M

OR

13. B). Solve the following differential equation by using Laplace transformation.   10M

$$\frac{d^{2}y}{dt^{2}}+2\frac{dy}{dt}-3y=\sin t; \quad y=\frac{dy}{dt}=0 \text{ when } t=0$$

14. A). A probability density function of a variable X is   10M

X	0	1	2	3	4	5	6
P(X)	K	3K	5K	7K	9K	11K	13K

i) Determine the value of K (ii) Find $P(X<4)$, $P(X\geq 5)$, $P(3<X\leq 6)$ (iii) Find Mean,

Variance and Standard deviation (iv) What will be minimum value of K so that $P(X\leq 2)>3$.

OR

14. B). i) The probability that a pen manufactured by a company will be defective is $1/10$. If 12   5M
such pens are manufactured, find the probability that exactly two will be defective.

ii) If X is a Normal variate with mean 30 and standard deviation 5, find the Probability   5M
that (i) $26\leq X\leq 40$ (ii) $X\geq 45$

15. A). i) A sample of 900 members has a mean of 3.4 cms and S.D. 2.61 cms. Is the sample   5M
from a large population of mean 3.25 cms and S.D. 2.61 cms. If the population is normal
and its mean is unknown, find the 95 % fiducial limits of true mean.

ii) In a sample of 1000 people in Maharashtra, 540 are rice eaters and the rest are wheat   5M
eaters. Can we assume that both rice and wheat are equally popular in this state at 1%
level of significance?

OR

15. B). i) A machinist is making engine parts with axle diameter of 0.7 inch. A random sample of   5M
10 parts shows mean diameter 0.742 inch with a standard deviation of 0.04 inch. On the
basis of this sample, would you say that the work is inferior?

ii) Two samples of sizes 9 and 8 give the sum of squares of deviations from their   5M
respective means equal to 160 inches^2 and 91 inches^2 respectively. Can these be regarded
as drawn from the same normal population.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)
B.Tech IV Semester Supplementary Examinations Nov/Dec-2025
Course Name: Basic Electrical Engineering
(Common for CSE, IT, CSC, CSD & AID)

Date: 10.12.2025 FN	Time: 3 hours	Max.Marks: 70

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries TWO marks.   **10x2=20M**

1.	Define resistance, inductance, and capacitance.	2 M
2.	State the Maximum Power Transfer theorem.	2 M
3.	What is the 'j' operator?	2 M
4.	Define form factor and peak factor.	2 M
5.	What is the principle of a DC Generator?	2 M
6.	What happens when back EMF equals supply voltage?	2 M
7.	What are the differences between an ideal and a practical transformer?	2 M
8.	Why does a transformer work only on AC supply?	2 M
9.	Define slip in a three-phase induction motor.	2 M
10.	Why are three-phase induction motors widely used in industry?	2 M

PART-B
Answer the following. Each question carries TEN Marks.   **5x10=50M**

11.A). Find the Maximum Power Transfer through load resistor R_L (2 Ω).   10M
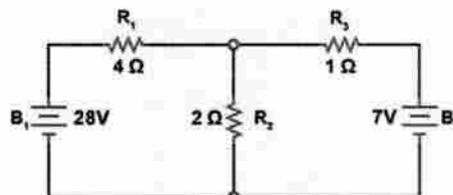
OR

11. B). Explain star-delta (Y–Δ) and delta-star (Δ–Y) transformations and Derive the conversion equations.   10M

12. A). Derive expressions for RMS and average values of a pure sinusoidal wave.   10M

OR

12. B). A 240 V, 50 Hz AC supply is applied a coil of 0.08 H inductance and 4 Ω resistance connected in series with a capacitor of 8 μF. Calculate the following – Impedance, Circuit current, Phase angle between voltage and current, Power factor.   10M

13. A). i) Derive the EMF equation of a DC Generator and explain the terms involved.   5M
ii) A 4-pole, D.C. generator has a wave-wound armature with 792 conductors. The flux per pole is 0.0121 Wb. Determine the speed at which it should be run to generate 240 V on no-load.   5M

OR

13. B). Explain the principle and operation of a DC Motor.   10M

(P.T.O..)

14. A). Explain the procedure for referring parameters from the secondary side to the primary side in a transformer also Draw the equivalent circuit.   10M

<div align="center">OR</div>

14. B). Explain the classification of three-phase transformers.   10M

15. A). i) Explain the principle of operation of a three-phase induction motor.   6M

ii) A 4-pole, 3-phase induction motor operates from a supply whose frequency is 50 Hz.   4M
Calculate:

   i) The speed at which the magnetic field of the stator is rotating
   ii) The speed of the rotor when the slip is 0.04
   iii) The frequency of the rotor currents when the slip is 0.03
   iv) The frequency of the rotor currents at standstill.

<div align="center">OR</div>

15. B). Derive the equation for torque in terms of slip and explain the significance of each term.   10M

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