Registration No.:

6thSemester Regular/Back Examination: 2023-24
SUBJECT: Design of Steel Structures
BRANCH(S): C&EE,CIVIL
Time: 3 Hour
Max Marks: 100
Q.Code: P351
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.
(Use of relevant IS codes is permissible)

Part-I

Q1	**Answer the following questions:**	**(2 x 10)**

a) List out the different types of load to be considered in design of steel structures.
b) State the design philosophies used for steel structure design.
c) What is structural steel? State the mechanical properties of structural steel.
d) In grade 5.6 bolts, what do the number 5 and 6 indicate?
e) Define efficiency of a joint.
f) What is net sectional area of a tension member?
g) Define lateral torsional buckling of a beam.
h) What is the function of a column base? Write different types of column bases used for steel columns.
i) Define effective length of a column.
j) Where plate girders are used?

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**

a) Illustrate the advantages of steel as a structural material.
b) Explain the difference between limit state of strength and serviceability for steel structure design.
c) A water tank is made with 10mm thick plates. The plates are joined by single bolted lap joint using 16mm diameter bolts of grade 4.6 at a pitch of 50mm. Find the efficiency of the joint.
d) State the assumptions used in welded connections.
e) Determine the rivet value of 18mm diameter rivets connecting 10mm plate in Single shear. The permissible stresses for rivets in shear and bearing are 80MPa and 250MPa respectively, and for plate in bearing is 250 MPa.
f) Explain different types of failures of a tension member.
g) Discuss different types of tension members with their applications.
h) Illustrate the design procedure for foundation bolts.

i) With neat sketch explain lacing and battening column systems.

j) Differentiate between web bucking and web crippling of a beam.

k) Discuss lateral stability of beams.

l) Explain the various elements of a plate girder with neat sketch.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A 150mm x 115mm x 12mm angle section is to be connected to a 12mm thick gusset plate at site. Design the fillet weld to carry a load equal to the strength of the member. **(16)**

Q4 Design a splice for tension member sections 160 x 10mm and 250 x 14mm. The member is subjected to a factored tensile load of 350kN. Assume Fe 410 grade of steel. Provide 20mm diameter bolts of grade 4.6 for making the connections. **(16)**

Q5 Design a suitable slab base for a column section ISHB 200 @ 365.9 N/m supporting an axial load of 400 kN. The base plate is to rest on M20 grade concrete. **(16)**

Q6 Design a simply supported beam of effective span 6 m carrying a UDL of 40kN/m, inclusive of self-weight. Use Fe 410 steel. **(16)**

Registration No.:

Total Number of Pages: 02

Course: B.Tech
Sub Code: REC6C001

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Microwave Engineering
BRANCH(S): ECE, ETC
Time: 3 Hour
Max Marks: 100
Q.Code: P357
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**
a) Draw the field pattern of a rectangular waveguide.
b) Define the mode of a coaxial cable transmission line.
c) Difference between power divider and power combiner.
d) Define the critical coupling used in microwave resonators.
e) What are the minimum and maximum values of the reflection coefficients?
f) Why parabolic reflector antenna is popularly used in long distance communication?
g) Define the conditions for oscillations.
h) Mention the applications of HEMT amplifier.
i) Define radiation pattern and gain of an antenna.
j) Discuss use of Smith Chart.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**
a) Draw and explain the lumped element circuit model for $\lambda/2$ transmission line and write the telegraphers equations.
b) Describe the design process for a cylindrical waveguide to support dominant mode.
c) Discuss the nature of a standing wave and the reflection coefficient for different load conditions.
d) A radio transmitter is connected to an antenna having an impedance $80 + j40\ \Omega$ with a coaxial cable. If the 50 Ω transmitter can deliver 30 W when connected to 50 Ω load, how much power is delivered to the antenna.
e) Write the S-matrix of directional coupler. A 10 dBm power source is connected to the input of a directional coupler having a coupling factor of 20 dB, a directivity of 30 dB, and an insertion loss of 0.1 dB. If all ports are matched, find the output powers (in dBm) at the through, coupled, and isolated ports.
f) Discuss the necessary conditions for a transistor amplifier to be stable.
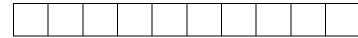g) Describe the V-I Characteristics of a Gunn diode.

h) Define different types of power gains in a two-port network.

i) Derive resonant frequency and loaded Q for a parallel resonator.

j) Describe gain compression and third order intercepts point of any non-linear device (Amplifier).

k) Describe different types of tropospheric attenuations during wave propagation.

l) Write short note on "Admittance measurement of pyramidal horn antenna".

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) A 50 coaxial line has a current $i(t, z) = 2 \cos (6 \times 10^9 t - 27z)$ mA. Determine (i) the frequency, (ii) the phase velocity, (iii) the wavelength, (iv) the relative permittivity of the line, (v) the phasor form of the current, and (vi) the time domain voltage on the line.   **(8x2)**

b) Explain single stub matching with an example.

Q4 a) Derive an expression for the Q of a transmission line resonator consisting of a short-circuited transmission line λ/4 long.   **(8x2)**

b) Design a lossless T-junction divider with a 50 Ω-source impedance to give a 2:1 power split. Design quarter-wave matching transformers to convert the impedances of the output lines to 50 Ω. Determine the magnitude of the scattering parameters for this circuit, using 50 -characteristic impedance.

Q5 a) Discuss the structure and principle of operation of Doherty amplifier.   **(8x2)**

b) Describe the characteristics and working principle of Mixer.

Q6 a) Describe different feed mechanism for parabolic reflector antenna with diagrams.   **(8x2)**

b) Describe any five desired antenna parameters required for any modern wireless communication systems.

Total Number of Pages: 02

Course: B.Tech
Sub_Code: REL6C001

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Power System Operation and Control
BRANCH(S): EEE, ELECTRICAL
Time: 3 Hour
Max Marks: 100
Q.Code : P362
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**
a) What is the diversity factor?
b) What is the relationship between load and frequency?
c) Write down the disadvantages of Gauss-seidel method.
d) What are Synchronizing Power Coefficients?
e) What do you mean by PV bus or Generator bus?
f) What are the assumptions for equal area criteria?
g) Define Unit Commitment
h) A 90 MVA 11 KV generator has an inertia H = 3. What is the stored energy in the rotor at synchronous speed?
i) What do you mean by p.u. value of any electrical parameter? How base values are selected for a power system?
j) What do you mean by Dynamic stability in a power system?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**
a) What are the factors affecting transient stability?
b) What is a single-area and two-area system?
c) Explain the importance of the slack bus in load flow studies.
d) Derive the term penalty factor of power system related to economic load dispatch.
e) Derive the expressions of critical clearing angle and critical clearing time.
f) What is the difference between equal area criteria and point by point method?
g) A loss-free alternator supplies 50 MW to an infinite bus, the steady state stability limit being 100 MW. Determine the load angle if the alternator will remain stable if the input to the prime mover of the alternator is abruptly increased by 40 MW.
h) Explain the effect on the generator if the sudden increase in mechanical output to this synchronous generator by using an equal area criterion.
i) Derive swing equation of the generator connected to the infinite bus bar.

j) The incremental fuel costs for two generation units 1 and 2 of a power plant are given by the following equations.

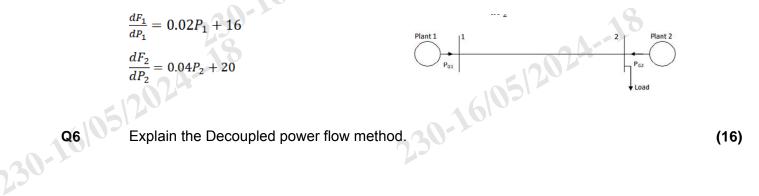$$\frac{dF_1}{dP_1} = 0.065P_1 + 25$$

$$\frac{dF_2}{dP_2} = 0.08P_2 + 20$$

Where F is the fuel cost in rupees per hour and P is the power output in MW. Find i) The economical loading of the two units when the total load supplied by the power plants is 160 MW. ii) The loss in fuel cost per hour if the load of 160 MW is equally shared by both Units.

k) Write down the equations governing the N-R load flow method. Derive the necessary expression of the Jacobian elements in the matrix.

l) Derive the penalty factor in the economics dispatch problem.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Derive the critical clearing angle for the fault on the bus bar in a parallel transmission line. **(16)**

Q4 A power system has a total load of 1260 MW at 60 Hz. The load varies by 1.5% for every 1% change in frequency (D = 1.5). Find the steady-state frequency deviation when a 60 MW load is suddenly tripped, if a) There is no speed control. b) The system has 240 MW of spinning reserve evenly spread among 500 MW of generation capacity with 5% regulation based on this capacity. All other generations are operating with values wide open. Assume that the effect of governing dead bands is such that only 80% of the governor responds to the reduction in system load. **(16)**

Q5 A two-bus system is shown in the following figure. If 100 MW is transmitted from plant 1 to the load; a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by the load when the system λ is Rs. 25/ MWh. The incremental fuel costs of the two plants are: **(16)**

$$\frac{dF_1}{dP_1} = 0.02P_1 + 16$$

$$\frac{dF_2}{dP_2} = 0.04P_2 + 20$$

Q6 Explain the Decoupled power flow method. **(16)**

Registration No.:

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Antenna Engineering
BRANCH(S): ETC, ECE
Time: 3 Hour
Max Marks: 100
Q.Code: P428
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   **(2 x 10)**

a) What are the basic requirements of a radio communication? Explain with block diagram.

b) A small dipole of length 10cm has 5A of rms current at 100MHz. Calculate the total power radiated by the dipole.

c) How the electromagnetic radiation is achieved? Again, under what condition the transmission line can radiate.

d) What is VSWR? How the VSWR is related to reflection coefficient?

e) How is frequency scanning performed?

f) Define radiation resistance and beamwidth of antenna.

g) Estimate the diameter of a paraboloidal reflector required to produce a beam of 5^0 width at 1.2 GHz.

h) What is beam switching?

i) What is popular feed mechanism for low noise application? Justify your answer.

j) What is the need for the Binomial array?

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 × 8)**

a) What are the Maxwell's equations? Explain the meaning of each Maxwell's equation.

b) An antenna has directivity gain of 30dB. Find the effective aperture at 10GHz. If the radiation efficiency is 80%.

c) A transmitting antenna having an effective height of 61.4 meters, takes a current of 50Amp at a wavelength of 625 meters. Find
   I. Radiation Resistance of the Antenna
   II. Power Radiated
   III. Antenna efficiency for a total antenna resistance of 50 Ohms.

d) Describe the principles of End-fire and Broadside array.

e) Calculate the angular aperture for parabolic antenna whose aperture number is 0.3 and aperture diameter is 10m.Also calculate the focal length.
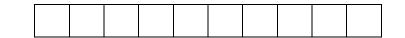
f) How the directivity of the antenna can be increased?

g) Discuss about the Application, Advantage, and Disadvantage of Microstrip Antennas.

h) How to measure gain of antenna using three antennas?

i) Describe the slotted line technique for impedance measurement.

j) Write explanatory notes on log periodic antenna.

k) Derive the input impedance of folded dipole antenna.

l) Define radiation resistance and beamwidth of antenna.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 In eight elements of linear array, each element is non-directive with in-phase signals. **(16)**
The spacing between the elements is λ/4.
(i) Draw a sketch of radiation pattern, using the principle of pattern multiplication.
(ii) What are the required phases at each element for the above array to radiate end-fire.
(iii) If the spacing between the elements is increased to λ, what is the nature of radiation pattern?
(iv) What is the directivity of end-fire array of 8 elements with spacing equal to 0.2λ.

Q4 Write the short notes on: **(4x4)**
(i) Yagi Antenna
(ii) Folded Dipole Antenna.
(iii) Horn Antenna
(iv) Parabolic reflector Antenna

Q5 Discuss about the mechanism of transmission of Cassegrain Feed Antenna. Also **(16)**
discuss about its construction, Application, Advantage, and Disadvantage of
Cassegrain Antenna.

Q6 Write short notes on: **(4x4)**
(i) Frequency Independent Antenna
(ii) Standing wave ration measurement
(iii) Measurement of Antenna pattern
(iv) Electronic Scanning Antenna.

Total Number of Pages: 02

Course: B.Tech
Sub_Code: RCS5D002

6ᵗʰ Semester Regular/Back Examination: 2023-24
SUBJECT: Artificial Intelligence & Machine Learning
BRANCH(S): AEIE,AUTO,C&EE,CIVIL,ECE,EEE,EIE,ELECTRICAL,ENV,ETC,MECH,MMEAM
Time: 3 Hour
Max Marks: 100
Q.Code: P103
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions: **(2 x 10)**
a)   How is machine learning related to AI?
b)   What is meant by the term "utility function" in the context of intelligent agents?
c)   How does an agent function determine the behavior of an intelligent agent?
d)   Describe the process of backtracking in problem-solving.
e)   Differentiatebetween minimax and alpha-beta pruning.
f)   What is the significance of game trees in adversarial search?
g)   How do Bayesian networks help address uncertainty in AI?
h)   What role do conditional probabilities play in probabilistic reasoning?
i)   Give four real-world applications of AI.
j)   What is the difference between uninformed and informed search algorithms?

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   **(6 × 8)**
a)   What is game theory? How is it important in AI?
b)   Differentiate between Natural (Human) Intelligence & Artificial Intelligence.
c)   What is learning with complete data? Explain the parameters of this learning model.
d)   Define Constraint Satisfaction Problems (CSPs). Explain how CSPs are formulated and solved using constraint propagation techniques.
e)   Convert the following sentences into predicate logic (first order logic).
(i)   John dislikes children who drink tea.
(ii)   Any person who is respected by every person is a king.
f)   Discuss the trade-offs between computational efficiency and accuracy in probabilistic inference.
g)   Define rote learning and discuss its role in artificial intelligence. Highlight scenarios where rote learning is effective and where it falls short.

h) How does learning with hidden variables differ from learning with observable variables? Provide examples and discuss challenges in learning with hidden variables.

i) Define the syntax and semantics of first-order logic. Explain the difference between first-order logic and propositional logic.

j) Describe the forward chaining method in first-order logic. How does it differ from backward chaining?

k) Write short notes on unification and lifting.

l) Explain the process of knowledge acquisition in the context of expert systems.

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain the concept of informed (heuristic) search strategies. Provide examples of algorithms, such as greedy best-first search and A* search, and explain how they use heuristic information to guide the search process. **(16)**

Q4 Explain the semantics of Bayesian networks and how they encode probabilistic dependencies between variables. Discuss the graphical representation of Bayesian networks and how it facilitates probabilistic inference. **(16)**

Q5 a) Discuss the process of knowledge engineering in the context of first-order logic. What are the challenges involved in encoding knowledge using first-order logic? **(8+8)**

b) Provide an example of knowledge representation using first-order logic for a domain of your choice, explaining the symbols and their meanings.

Q6 What are expert system shells, and how do they facilitate the development of expert systems? Discuss the components of expert system shells and their role in building knowledge-based systems. **(16)**

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Compiler Design
BRANCH(S): CSE,CSEAIME,CST
Time: 3 Hour
Max Marks: 100
Q.Code: P269
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Find the RE for all the string whose left most symbol differ with the right most symbol over an alphabet {a, b}.

b) Why is buffering used in lexical analysis? What are the commonly used buffering methods?

c) Define 'Handle Pruning' in bottom-up parsing.

d) Mention the conflicts that occur in shift-reduce parser with examples.

e) What is three address codes? Mention the various representation of three address code?

f) What is type checking? When is the type checking usually done?

g) Mention various machine independent code optimization techniques.

h) What is a DAG? Write the applications of DAG in code optimization.

i) Consider the grammar with the following translation rules and E as the start symbol.

$E \rightarrow E1 \# T$ {E.value = E1.value * T.value} | T {E.value = T.value}

$T \rightarrow T1 \& F$ {T.value = T1.value + F.value} |F {T.value= F.value}

$F \rightarrow num$ {F.value = num.value}

Compute E.value for the root of the parse tree for the expression: 2 # 3 & 5 # 6 &4.

j) What are the various data structures used to create symbol table?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Define Regular expression. Explain the properties of Regular expressions. Construct an FA equivalent to the regular expression
(0+1)*(00+11)(0+1)*

b) Discuss the issues associated with grammars in top-down parsing.

c) Construct the CLR parser for the following grammar.
S→ (L) | a
L→ L,S | S

d) Consider the following grammar
$S \rightarrow AS \mid b$
$A \rightarrow SA \mid a$
Construct the SLR parse table for the grammar.

e) Draw the annotated parse tree for
i. int a, b, c
ii. float w, x, y, z
$D \rightarrow T L \mid L.inh = T.type$
$T \rightarrow int \mid T.type = integer$
$T \rightarrow float \mid T.type = float$
$L \rightarrow L1, id \mid L1.inh = L.inh \mid addType (id.entry, L.inh)$
$L \rightarrow id \mid addType(id.entry, L.inh)$

f) Explain
(i) common subexpression elimination
(ii) code motion
with suitable example

g) Consider the following grammar with translation scheme. Find the three-address code for the following expression
p>q AND r<s OR u>NOT r

Grammar	Translation Scheme
$E \rightarrow E\ OR\ E$	$E.place:=newtemp(\ );$ $E.code:=E_1.code\|\|E_2.code\|\|g(E.place":=" E_1.place"OR" E_2.place)$
$E \rightarrow E\ AND\ E$	$E.place:=newtemp(\ );$ $E.code:=E_1.code\|\|E_2.code\|\|g(E.place":=" E_1.place"AND" E_2.place)$
$E \rightarrow NOT\ E$	$E.place:=newtemp(\ );$ $E.code:= E_1.code\|\|g(E.place":=""NOT" E_1.place)$
$E \rightarrow (E)$	$E.place:= E_1.place;$ $E.code:= E_1.code;$
$E \rightarrow id\ relop\ id$	$E.place:=newtemp(\ );$ gen("if" $id_1.placerelop.opid_2.place$ "goto" nextstate+3"; $E.place:="0";$ "goto" nextstate+2;" $E.place:="1")$
$E \rightarrow TRUE$	$E.place:=newtemp(\ );$ $gen(E.place:="1")$
$E \rightarrow FALSE$	$E.place:=newtemp(\ );$ $gen(E.place:="0")$

h) Describe the issues associated with code generation phase.

i) Construct the DAG for the following basic block. Generate the target code for the obtained DAG using a single register.
d := b * c
e := a + b
b := b * c
a := e – d

j) Explain the characteristics of peephole optimization.

k) Describe S-attributed and I-attributed grammar with suitable example.

l) Explain various storage allocation strategies with examples.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Construct an SLR parsing table for the following grammar: **(16)**
R → R + R | RR | R* | (R) | a | b
Resolve the parsing action conflicts in such a way that regular expression will be parsed normally. Consider the left associativity for all operators and operator precedence are as follows
( )> * > concatenation > +

Q4 Explain about Type checking, Type expression, and Type Conversion with examples **(16)**

Q5 Discuss about the following: **(4x4)**
a) Copy Propagation
b) Dead code Elimination
c) Code motion.
d) Loop Invariant

Q6 What is an activation record? Draw diagram of General Activation record and explain the purpose of different fields of an activation record. **(16)**

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Design of Machine Elements
BRANCH(S): MECH, MMEAM
Time: 3 Hour
Max Marks: 100
Q.Code: P349
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1　　**Answer the following questions:**　　　　　　　　　　　　　　**(2 x 10)**
- **a)** Explain what is factor of safety.
- **b)** What is meant by endurance limit of material?
- **c)** What is nipping of leaf spring?
- **d)** What is full journal bearing?
- **e)** What are preferred numbers?
- **f)** Mention the assumptions used in the design of keys.
- **g)** What are different types of stresses induced in bolts?
- **h)** Differentiate between crushing and bearing stress.
- **i)** Which joint is stronger riveted or welded? Give reasons.
- **j)** Differentiate between a cotter and key.

Part-II

Q2　　**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**　　**(6 × 8)**
- **a)** Determine the thickness of a 120 mm wide uniform plate for safe variable loading operation, if the plate is to be subjected to a tensile load that has a maximum value of 250 kN and a minimum value of 100 kN. The material has an endurance limit stress of 225 MPa, yield strength of 300 MPa, and factor of safety 1.5.
- **b)** Explain how the strength of transverse & parallel fillet weld joints is determined.
- **c)** A shaft made of mild steel is required to transmit 100 kW at 300 *r.p.m.*. The supported length of the shaft is 3 metres. It carries two pulleys each weighing 1500 N supported at a distance of 1 metre from the ends respectively. Determine the diameter of the shaft if the shaft allowable shear stress is 60 MPa.
- **d)** Explain the design procedure for knuckle joint with suitable sketches.
- **e)** A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are:
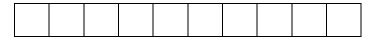 σ_t = 120 MPa; τ = 100 MPa; σ_c = 150 MPa.
  Find the efficiency of joint taking the strength of the rivet in double shear as twice than that of single shear.

f) Find the diameter of a solid steel shaft to transmit 20 kW at 200 r.p.m.. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5

g) Design a cotter joint for the transmission of 20 kN tensile or compressive loads. Allowable stresses for all the components may be taken as σ_{at} = 50 N/mm^2, σ_{acr} = 80 N/mm^2, and τ_a = 40 N/mm^2.

h) A turbine shaft transmits 400 kW at 1000 rpm. The permissible shear stress is 80 N/mm^2 while twist is limited to 0.5° in a length of 2.5 m. Calculate the diameter of shaft. Take G = 8 × 10^4 N/mm^2. If the shaft chosen is hollow with d_i/d_o = 0.6, calculate the % saving in the material.

i) Discuss the various factors to be considered for the selection of materials for the design of machine elements.

j) Describe the procedure for designing longitudinal joint for boiler.

k) Design a knuckle joint to connect two tie rods, subjected to an axial pull of 120 KN. Assume the following working stress: Allowable tensile stress = 55 N/mm^2. Allowable compressive stress = 80 N/mm^2, Allowable shear stress = 40 N/mm^2.

l) What are the advantages & disadvantages of welded joints over riveted joints?

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A steel shaft of 60 mm diameter is subjected to a bending moment of 12 kN-m and a torque T. If the yield point of steel in tension is 910 N/mm^2, find the maximum value of this torque without causing yielding of the shaft according to maximum distortion energy theory. **(16)**

Q4 A rectangular steel plate 100 mm wide is welded to a vertical plate to form a cantilever with an overlap of 50 mm and an overhang of 150 mm. It carries a vertical downward load of 60 kN at free end. Fillet weld is done to three sides of the plate for a permissible stress of 140 N/mm^2. Determine the size of the weld. **(16)**

Q5 A helical spring is made from a wire of 8 mm diameter and is of outside diameter 75 mm. The spring has 6 numbers of active coils, If the permissible stress in shear is 350 N/mm^2 and the modulus of rigidity is 84 kN/mm^2, find the axial load, which the spring can take and also the deflection produced. **(16)**

Q6 Design a suitable ball bearing for an axial flow compressor to carry a radial load of 2.5 kN and a thrust load of 1.3 kN. The service imposes a light shock with shock factor 1.5 and bearing will be in use for 35 hours per week for 4 years. The speed and diameter of shaft are 900 rpm and 45 mm respectively. Assume X = 0.56 and Y = 1.4. **(16)**

Registration No.:

Total Number of Pages : 02

Course: B.Tech
Sub_Code: REL6D001

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Electric Power System Protection
BRANCH(S): ELECTRICAL
Time: 3 Hour
Max Marks: 100
Q.Code: P437
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   Answer the following questions: **(2 x 10)**

a) What do you mean by burden of relay and what is its unit?

b) What are the advantages of static relays over electromagnetic relays?

c) What do you mean by under reach and over reach of a relay?

d) An oil circuit breaker is rated at 1500 amps, 2000 MVA, 33kV, 3 sec, and 3 phases. Determine the making current and breaking current.

e) What is the function of a polarised relay?

f) What is the difference between time lag and instantaneous relays?

g) What do you understand by "Holding Ratio"?

h) What are the advantages and disadvantages of an Oil circuit breaker?

i) Explain what you mean by RRRV. Write its mathematical expression.

j) What are the applications of DC relays?

Part-II

Q2   Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)   **(6 × 8)**

a) Explain the construction and principle of operation of Shaded Pole Type non-directional relays. Comment on the merits and demerits of this type of relays.

b) Discuss the various components used in protective system and explain the basic principle of operation of electric power system protection.

c) Write a short note on the Current Chopping and Explain how to minimize its effect.

d) A 50 MVA, 11 kV, 3 phase alternator is subjected to different types of faults. The fault currents are as follows; 3-phase fault = 2000 Amps; Line-to-Line fault = 2600 Amps; Line-to-ground fault = 4200 Amps. The generator neutral is solidly grounded. Determine the values of the three sequence reactances of the alternator. Ignore the resistances.

e) What is meant by RRRV? Derive the expression for RRRV.

f) In short circuit test on a 3 pole, 132 kV circuit breaker, the following observations are made; p.f. of fault is 0.4, recovery voltage is 0.9 times the full line value, the breaking current is symmetrical, frequency of oscillations of restriking voltage is 16 kHz. Assuming neutral is grounded and fault is not grounded, determine the average RRRV.

g) Explain the principle of operation of directional over current relays with mathematical background. Explain what is meant by directional properties of the relays.

h) What is the need for Bus Bar Protection? How the Bus Bars protection scheme is realized. Comment on the stabilization of this type of protection scheme.

i) Explain the pilot protection scheme used in power system. Describe the different type of pilots with applications.

j) With a neat diagram explain the construction and principle of operation of Buchholz relays. Comment on the challenges on its design and operation.

k) Write a short note on SF6 Circuit Breakers.

l) Write a short note on the Coincidence type phase comparator.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 A 3-phase 20 MVA, 11kV star connected alternator has a synchronous reactance of 2.5 ohm/phase and resistance of 0.75 ohm/phase. It is being protected by a Merz-price balanced current system. Determine that what portion of the winding remains unprotected and if the neutral of the alternator is earthed through a resister of 5 ohms. Assume that the relay operates, when the out of balance current exceeds 25 % of the load current. **(16)**

Q4 Explain the construction and principle of operation of Balanced Beam type impedance relays and derive the mathematical equations for this type of relays. Discuss the opportunities and challenges faced for this type relays. **(16)**

Q5 Elaborate with neat diagram the strategy adopted for motor protection in power system. Discuss the challenges in the protection along with their merits and demerits. **(16)**

Q6 Describe the construction and principle of operation of Vacuum circuit breaker with neat sketches. Give a comparative analysis of Vacuum circuit breaker with that of air blast circuit breaker. **(16)**

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Foundation Engineering
BRANCH(S): CIVIL
Time: 3 Hour
Max Marks: 100
Q.Code: P439
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** (2 x 10)

a) What is the depth of tension crack in soft clay for $\gamma = 0°$ if c = 100 kPa and $\gamma = 20$ kN/m^3?

b) What is the practical significance of earth pressure theory?

c) What are different types of retaining walls?

d) What is the difference between general and local shear failures?

e) State the circumstances to go for combined footing.

f) What are the types of soil samples?

g) What are stages of sub soil investigation?

h) Write the difference between well foundation and caissons.

i) Discuss the situations where a well foundation is more suitable than other types offoundations.

j) What type of shear failure of soil is more likely to happen in the case of very dense soil? Justify.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** (6 × 8)

a) Clearly explain the difference between the active and passive earth pressure. Give two examples of each kind.

b) Explain about the construction of Culmann's graphical method.

c) Explain the terms with neat sketches: (I) active earth pressure, (II) passive earth pressure, and (III) at rest earth pressure.

d) What is settlement? What are the components of settlement? Distinguish between them.

e) Explain plate load test with sketch.

f) Explain the in-situ penetration tests for Estimating the load carrying capacity of a single driven pile.

g) Define negative skin friction. What is its effect on the pile?

h) Classify the methods of sub-soil exploration and explain in detail Augur boring method.

i) Determine the area ratio, inside clearance and outside clearance for the following soil samples and comment on the nature of the samples obtained.
(i) Core edge: 77 mm outer & 70 mm inner diameter.
(ii) Sampling tube: 74 mm outer & 72 mm inner diameter

j) Explain various types of footing with neat sketch.

k) Write a note on Under-reamed pile with neat sketch.

l) Discuss various types of defects in rock mass.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** What are the design criteria to be satisfied for the stability of a gravity retaining wall? Discuss briefly. **(6)**

b) A retaining wall 4m high supports a backfill (cohesion = 20 kN/m^2, angle of internal friction = 30° and bulk unit weight = 20 kN/m^3) with horizontal top. The backfill carries a surcharge of 20 kN/m^2. If the wall is pushed towards thebackfill, compute the total passive pressure on the wall and its point of application? **(10)**

Q4 **a)** What are the factors influencing the bearing capacity of a footing on: (i) cohesion less soil; (ii) purely cohesive soil. **(6)**

b) The foundation for a square footing of width 2m is to be founded at a depth of 1.5m.The soil properties are c = 0, ϕ = 36°, γ =18.2 kN/m^3, γ_{sat} = 20 kN/m^3. Determine the net ultimate bearing capacity, when the water table is at (i) 1 m below ground level; (ii) 1 m below foundation level. (for ϕ = 36°, N_c = 52, N_q= 32 & N_γ= 35) **(10)**

Q5 **a)** Enlist the different geophysical method. Explain any one in detail withits limitations. **(8)**

b) A Group of friction pile in clay consists of 12 piles of 500 mm dia. Grouped as 4 x 3 spaces outer to outer at 1.0m apart. If the undrained shear strength of clay is 7kN/m^2 and piles are 15m long, estimate the group capacity of pile. Take adhesion factor as 1.0. **(8)**

Q6 **a)** A SPT was conducted in a dense sand deposit at a depth of 22m, and a value of 48 was observed for N. The density of the sand was 15kN/m^3.What is the value of N, corrected for over burden pressure? **(6)**

b) With neat sketch explain the various components of well foundation indicating the function of each. **(10)**

6ᵗʰ Semester Regular/Back Examination: 2023-24
SUBJECT: Numerical Methods
BRANCH(S): CSE, CSEAIME, CSEAI
Time: 3 Hour
Max Marks: 100
Q.Code : P118
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1	**Answer the following questions:**	**(2 x 10)**

a) Explain the geometrical interpretation of Newton's Raphson method.

b) Find the number of significant digits in the number 0.0003580001.

c) Find the interval in which the smallest positive root of the equation $x^3 - x - 4 = 0$ lies.

d) Write the advantage of Gauss-Seidel method over Gauss-Jacobi method.

e) Write the Newton-Cotes quadrature integration formula.

f) Explain simple trapezoidal rule geometrically.

g) If the numbers of interpolating points are n+1, then write the possible degrees of the corresponding interpolating polynomial.

h) What is the order of a k-step Adams-Moulton method?

i) Using Euler-Cauchy method, find $f(0.6)$, if $y' = y - x^2 + 1, y(0) = 0.5,$
$$h = 0.2.$$

j) What is the truncation error of Euler's method?

Part-II

Q2	**Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**	**(6 × 8)**

a) Determine L and U to compute the LU factorization of the matrix
$$A = \begin{pmatrix} 2 & 1 & 1 \\ 4 & 5 & 2 \\ 2 & -2 & 0 \end{pmatrix}$$

b) How many iteration is required for approximation of root f(x)=0 in [a,b], for which error is less than 10^{-6} in bisection method?

c) Find the solution of the system of equations $45x_1 + 2x_2 + 3x_3 = 58, -3x_1 + 22x_2 + 2x_3 = 47, 5x_1 + x_2 + 20x_3 = 67$ correct to three decimal places, using the Gauss-Seidel iteration method.

d) Find a real root of the equation $x^3 + x^2 - 1 = 0$ by fixed point iteration method upto 3 significant digits.

e) Using Lagrange's interpolating formula, find the polynomial of maximum degree from the following data

x	–5	–3	0	1
$f(x)$	–8.345	–1.756	–2.003	7.984

f) Construct Newton's divided difference table and find an interpolating polynomial for the following data. Also evaluate $f(1)$

x	–1	0	2	5
$f(x)$	–11	–5	–5	5

g) Use Gauss-Legendre three point rules to evaluate $\int_0^1 \frac{dx}{1+x^2}$ and estimate the error.

h) Find the value of $\log 2$ from $\int_0^1 \frac{x^2}{1+x^3}dx$ using Simpson's one-third rule with $h = 0.25$.

i) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Romberg's method.

j) Using the modified Euler method, find y(0.6) if h=0.1 and $y' = x^2 + y^2, y(0) = 1$.

k) Find the smallest eigenvalue in magnitude of the matrix $A = \begin{pmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{pmatrix}$ using 4 iterations of the inverse power method.

l) Find the approximate value of $y(0.3)$ using the Adams-Bashforth method of third order for the initial value problem $y' = x^2 + y^2, y(0) = 1, h = 0.1$.
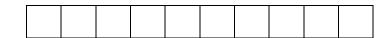
Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 a) Define truncation error. What is the absolute, percentage and relative errors involved if $y = \frac{2}{3}$ is represented in normalized decimal form with 6-digits? **(8x2)**

b) Explain the loss of significant digits with a suitable example.

Q4 Discuss the advantage of interpolation. Obtain the cubic spline approximation for the function defined by the data **(16)**

x	0	1	2	3
$f(x)$	1	2	33	244

With $M(0) = 0, M(3) = 0$. Hence find and estimate $f(2.5)$.

Q5 For the initial value problem $u' = t + u, u(0) = 1$, estimate $u(0.5)$ using third order Adams-Moulton method and Milne-Simpson fourth order method with $h = 0.1$. Again, compare the results with exact solution. Which method will give more accurate result? **(16)**

Q6 Using classical Runge-Kutta fourth order method to solve the system of differential equations $u' = -3u + 2v, v' = 3u - 4v, u(0) = 0, v(0) = 0.5$ with $h = 0.2$ on the interval [0,0.4]. **(16)**

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Optimization in Engineering
BRANCH(S):AE,EIE,AERO,AG,AME,AUTO,BIOMED,BIOTECH,C&EE,CHEM,CIVIL, CSE, CSEAIME, CSIT,CST,ECE,EEE,EIE,ELECTRICAL,ELECTRICAL & C.E,ELECTRONICS & C.E,ENV,ETC,IT,MANUTECH,MECH,METTA,MINERAL,MINING,MME,MMEAM,PE,PLASTIC,PT
Time: 3 Hour
Max Marks: 100
Q.Code : P050
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Write one advantage and one disadvantage of operations research model.

b) What do you mean by infeasible solution?

c) If a dual has unbounded solution then what can you say about the solution of corresponding primal problem.

d) While solving a transportation problem, what is the meaning of occurrence of degeneracy?

e) In an assignment problem there are 4 workers and 3 jobs. Find the total number of possible assignments.

f) Write two advantages of Branch and bound method.

g) What is the difference between constrained and unconstraint optimization problems?

h) Is Beale's method better as compare to Wolfe's method? Explain the answer.

i) Write two limitations of queueing theory.

j) Explain the single channel queuing models.

Part-II

Q2 **Only Focused-Short Answer Type Questions - (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Use Big-M method solve the following LPP: Min $z = 12x_1 + 20x_2$
subject to $6x_1 + 8x_2 \geq 100,\ 7x_1 + 12x_2 \geq 120;\ x_1, x_2 \geq 0$.

b) Use dual simplex method solve the LPP $Min\ z = 3x + y$ subject to $x + y \geq 1, 2x + 3y \geq 2, x, y \geq 0$.

c) Rolls of paper having a fixed length and width of 180 cm are being manufactured by a paper mill. These rolls have to be cut to satisfy the following demand:

Width:	80cm	45cm	27cm
No. of rolls:	200	120	130

Obtain the linear programming formulation of the problem to determine the cutting pattern. So that the demand is satisfied and wastage of paper is minimum.

d) Obtain the initial basic feasible solution for the following transportation problem using north-west corner rule:

$$
\begin{array}{c}
\begin{array}{cccc} D & E & F & G \end{array} \\
\begin{array}{c} A \\ B \\ C \end{array}
\begin{bmatrix} 5 & 3 & 6 & 2 \\ 4 & 7 & 9 & 1 \\ 3 & 4 & 7 & 5 \end{bmatrix}
\begin{array}{l} 19 \\ 37 \text{ Available} \\ 34 \end{array} \\
\begin{array}{cccc} 16 & 18 & 31 & 25 \end{array} \\
\text{Demand}
\end{array}
$$

e) What are the methods used to solve assignment problems. Among them, which one is more suitable and why?

f) Use Branch and bound method solve the LPP: $Max\ z = 7x_1 + 9x_2$, subject to $-x_1 + 3x_2 \leq 6,\ 7x_1 + x_2 \leq 35,\ x_2 \leq 0,\ x_1, x_2 \geq 0;\ x_1, x_2$ are integers.

g) Obtain the set of necessary conditions for the nonlinear programming problem: $Min\ z = kx^{-1}y^{-2}$, subject to $x^2 + y^2 - a^2 = 0, x, y \geq 0$ and hence find the minimum value of z.

h) Discuss the role of Kuhn-Tucker conditions in nonlinear programming problems.

i) Write a short not on Golden Section Search method.

j) A TV repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they come in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8-hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought-in?

k) Discuss operating characteristics of a queuing system.

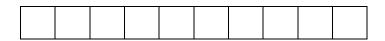**l)** Define a queue and explain the various queue disciplines.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 What are the variations considered in Sensitivity analysis? **(16)**
Consider the LPP: Max $z = 3x_1 + 5x_2$ subject to $x_1 \leq 4, 3x_1 + 2x_2 \leq 18; x_1, x_2 \geq 0$.
If a new variable is introduced, with $c_5 = 7$ and $a_5 = [1,2]$; discuss the effect of adding
The new variable and obtain the revised solution, if any.

Q4 Obtain the initial basic feasible solution for the following transportation problem. Is this **(16)**
optimal? If not, modify it to obtain a better feasible solution.

$$
\begin{array}{c}
\begin{array}{cccc} D & E & F & G \end{array} \\
\begin{array}{c} A \\ B \\ C \end{array}
\begin{bmatrix} 6 & 1 & 9 & 3 \\ 11 & 5 & 2 & 8 \\ 10 & 12 & 4 & 7 \end{bmatrix}
\begin{array}{l} 70 \\ 55 \text{ Supply} \\ 90 \end{array} \\
\begin{array}{cccc} 85 & 35 & 50 & 45 \end{array} \\
\text{Demand}
\end{array}
$$

Q5 What is a general nonlinear programming problem? Solve the Quadratic programming **(16)**
problem: $Max\ z = 6x_1 + 3x_2 - 4x_1x_2 - 2x_1^2 - 3x_2^2$,
Subject to $x_1 + x_2 \leq 1,\ 2x_1 + 3x_2 \leq 4;\ x_1, x_2 \geq 0$.

Q6 Explain the following with reference to queuing models: **(16)**
(i) M/M/1   (ii) Characteristics and classification

Total Number of Pages: 02   **Course: B.Tech**
                                                          Sub_Code: RCS6D001

6th Semester Regular/Back Examination: 2023-24
Real-Time System
BRANCH(S): CSE, IT
Time: 3 Hour
Max Marks: 100
Q.Code: P451
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   **(2 × 10)**
   a) Name any two important sensor devices and actuator devices used in real-time applications.
   b) What are the shortcomings of Windows NT?
   c) Discuss the schedulability criterion for RMA scheduling algorithm.
   d) Define byzantine clock. Explain with an example.
   e) What is a watchdog timer?
   f) Distinguish between response time and execution time of a real-time task.
   g) In a real-time system differentiate between performance constraint and behavioral constraint.
   h) What is the difference between CBR, VBR, and sporadic traffic type?
   i) What do you understand by an optimal scheduling algorithm? Is it true that the time complexity of an optimal scheduling algorithm for scheduling a set of real-time tasks in a uniprocessor is prohibitively expensive to be of any practical use? Explain your answer.
   j) Differentiate between synchronous and asynchronous I/O.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   **(6 × 8)**
   a) Explain how a real-time operating system differs from a traditional operating system. Name a few real-time operating systems that are commercially available.
   b) Define "Fail-safe" state of a system. Justify your answer "safety-critical real-time systems do not have a fail-safe state".
   c) Identify the key differences between hard, soft, and firm real-time systems. Give at least one example of real-time tasks corresponding to these three categories.
   d) Would it be advisable to use an Ethernet LAN in a hard real-time application such as factory automation? Justify your answer. Evaluate the pros and cons of using an Ethernet-based protocol in such an application.

e) What is QoS routing? Briefly explain the different types of QoS routing algorithms used.

f) Explain chain blocking. Can a task undergo Chain Blocking in Highest Locker Protocol (HLP)?

g) Describe the focused addressing and bidding and buddy algorithm for running a set of real-time tasks in a distributed environment.

h) Consider a calendar-based reservation protocol to transmit real-time messages over a collision-based network. Explain how transmission of asynchronous messages by nodes can be handled. Note that asynchronous messages have probabilistic arrival times and do not have any specified time bounds.

i) What is a safety-critical system? Give a few practical examples of safety critical hard real-time systems. Are all hard real-time systems safety-critical? If not, give at least one example of a hard real-time system that is not safety critical.

j) List the key differences between real-time databases with a traditional database.

k) Briefly indicate how Unix dynamically recomputes task priority values. Why is such recomputation of task priorities required? What are the implications of such priority recomputations on real-time application development?

l) Explain why 2PL-WP protocol is not free from deadlocks.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Explain the operation of priority ceiling protocol (PCP) in sharing critical resources among real-time tasks. Explain how PCP is able to avoid deadlock and chain blockings. **(8)**

b) What is DDC? What are the advantages of DDC over analog control? Discuss PID control algorithm. **(8)**

Q4 **a)** What do you understand by "scheduling point of a task" in scheduling algorithm? How the scheduling points are are determined in clock driven, event-driven, and hybrid schedulers? **(8)**

b) Three hard real-time periodic tasks such as T1 = (50ms, 100ms, 100ms), T2 = (70ms, 200ms, 200ms) and T3 = (60ms, 400ms, 400ms) are to be scheduled on a uniprocessor using RMA. Can the task set be feasibly scheduled? (Show all the intermediate calculations.) **(8)**

Q5 **a)** What do you mean by priority inversion? Distinguish bounded from unbounded priority inversion. Demonstrate with a neat diagram. **(8)**

b) Briefly explain the highest locker protocol scheme for avoiding priority inversion. **(8)**

Q6 **a)** Why is it necessary to synchronize the clocks in a distributed real-time system? Discuss the relative advantages and disadvantages of the centralized and distributed clock synchronization schemes. **(8)**

b) Explain why traffic gets distorted in a multi segment network and how traffic reshaping is achieved for providing QoS guarantee. **(8)**

6th Semester Regular / Back Examination: 2023-24
SUBJECT: Smart and Composite Materials
BRANCH(S): MECH
Time: 3 Hour
Max Marks: 100
Q.Code: P453
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1   **Answer the following questions:**   (2 x 10)
  a)   What is a composite material?
  b)   Name two synthetic organic fibers.
  c)   Name any two methods used for measuring bond strength.
  d)   What do you understand by wettability?
  e)   State any two important metallic matrices used in metal matrix composites.
  f)   Define rheocasting metal matrix composite processing method.
  g)   What are technical ceramics?
  h)   Give simple classification of the polymers used for matrices of composites.
  i)   What is a PEEK matrix composite?
  j)   Define the critical fibre length.

Part-II

Q2   **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)**   (6 × 8)
  a)   Briefly discuss about the benefits of composites.
  b)   What are synthetic inorganic fibers? Give a detail description.
  c)   Discuss about particulate and whisker reinforcements.
  d)   Explain diffusion bonding solid state processing technique.
  e)   What ceramic matrix composite would you select, giving your reasoning for the following applications:
    I. Cutting tool
    II. Insulation for an inert atmospheric furnace, and
    III. Leading edge of a missile
  f)   Explain the techniques involving slurries for processing of Ceramic matrix composites.
  g)   Describe the chemical vapour deposition (CVD) technique for processing of Ceramic matrix composites.
  h)   Compare between thermosetting and thermoplastics polymers.
  i)   With neat sketch, elaborate the Resin Transfer Molding (RTM) fabrication process of polymer matrix composite.

j) Describe the various steps in mechanical recycling of polymer matrix composite.

k) Discuss the reasons for using short fibre composites.

l) Explain the thermal and moisture effect on longitudinal tensile strength of composites.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Compare the mechanical properties of the three main classes of composite materials, namely metals, ceramics, and polymers. **(16)**

Q4 Discuss the various liquid state processes for the production of metal matrix composites. Also, mention the advantages and limitations of the processes. **(16)**

Q5 With a neat sketch, explain the Sol-gel processing technique of Ceramic matrix composites. **(16)**

Q6 Write short note on the followings: **(4x4)**
    a) Honey comb structures
    b) Longitudinal tensile strength of composite micromechanics model
    c) Environmental effects in polymer matrix composites
    d) Hand lay-up method

Total Number of Pages: 02
Course: B.Tech
Sub_Code: RCS6C001

6th Semester Regular/Back Examination: 2023-24
SUBJECT: Software Engineering
BRANCH(S): CSE,CSEAI,CSEAIME,CSIT,CST,ELECTRICAL & C.E,ELECTRONICS & C.E,IT
Time: 3 Hour
Max Marks: 100
Q.Code: P366
Answer Question No.1 (Part-1) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) What is meant by a software life cycle?
b) Distinguish between a data flow diagram and a flow chart.
c) What are the main shortcomings of DFD as a tool for performing structured analysis?
d) What is the difference between black box testing and white box testing?
e) What do you mean by agile models?
f) What are the major shortcomings of iterative waterfall model?
g) Define Is-A relationship and Has-A relationship.
h) What are the objectives of feasibility study phase of software development?
i) What do you mean by product visibility in the context of software development?
j) Write four desirable characteristics of a good software requirement specification document.

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 × 8)**

a) Explain the requirement inception and requirement elaboration in the context of software requirement engineering.
b) What do you mean by system testing? What are the different kinds of system testing that are usually performed on large software products?
c) Discuss the major differences between the function oriented and the object oriented approaches to software design. Corroborate your answer through suitable examples.
d) What do you mean by cohesion and coupling in the context of software design? How are these concepts useful in arriving at a good design of a system?
e) Explain with a suitable example how a DFD model of software can be created from its source code.

f) Design the black box test suite for a function named **Quadratic Solver**. Quadratic Solver accepts 3 floating point numbers (a, b, c) representing a quadratic equation of the form $ax^2 + bx + c = 0$. It computes and displays the solution.

g) What is RAD model? Explain.

h) Explain how a software development effort is initiated and finally terminated in the spiral model.

i) Write different types of requirements gathering activities that the analysts use to gather requirements from a customer.

j) Explain Cyclomatic complexity measure with examples.

k) What is Regression testing? Explain with example.

l) Describe SaaS with example.

Part-III
Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 Explain with diagram the iterative waterfall model of software development. On your diagram, represent the deliverables that need to be produced at the end of each phase. **(16)**

Q4 Elaborate Software Reverse Engineering in detail. **(16)**

Q5 Design the black box test suite for a program that accepts two strings and checks if the first string is a substring of the second string and displays the number of times the first string occurs in the second string. **(16)**

Q6 Discuss the process models for software maintenance and indicate how you would select an appropriate maintenance model for a maintenance project at hand. **(16)**