

Q.P. Code: 252412

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: BRIDGE ENGINEERING (CE)

Time: 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

Note: IRC, IS 456-2000 & IS 800 – 2007 Codes are permitted in the Examination Hall

UNIT - I

1. (a) Write about the various railway bridge loading standards (B.G and M.G Bridges) 7M
(b) List out the various loads that will act in bridges. 7M

(OR)

2. (a) Discuss in detail about the various loads that should be considered for the design of bridges. 7M
(b) Write about the Highway Bridge Loading Standards. 7M

UNIT – II

3. Design a Box Culvert having inside dimensions of 3.5 x 4 m. The culvert is subjected to a dead load of 12 kN/m² and a live load of IRC Class “AA” tracked vehicles. Assume unit weight of soil to be 18 kN/m². The angle of repose of soil is 30°. Use M30 grade concrete and Fe415 grade steel. Consider the thickness of slab and walls as 200 mm. The road width is 7.5m and the span is 4 m. Adopt MD method for calculating the final moments of the box culvert. 14M

(OR)

4. Design a Box Culvert having inside dimensions of 3 x 3 m. The culvert is subjected to a dead load of 10 kN/m² and a live load of IRC Class “AA” tracked vehicles. Assume unit weight of soil to be 18 kN/m². The angle of repose of soil is 25°. Use M40 grade concrete and Fe500 grade steel. Consider the thickness of slab and walls as 200 mm. 14M

UNIT – III

5. Design a reinforced concrete slab culvert for a National Highway to suit the following data: 14M
Carriage way - 7.5 m; Foot paths on either side - 0.75 m
Clear span of the bridge = 6 m; Wearing coat thickness = 80 mm
Width of bearing is 400mm; Live load : IRC class AA tracked vehicle
Materials used: M35 grade of concrete, Fe415 HYSD bars
Permissible stresses: σ_{cbc} is 8.5 MPa, σ_{st} = 200 N/mm²
Design RC Deck slab and sketch the details of reinforcement in longitudinal and cross-section of the slab.

(OR)

6. Explain about the effective width method for the design (only) of deck Slab Bridge of simply supported subjected to class AA tracked vehicles. 14M

UNIT – IV

7. Design the interior panels of slabs of a RCC T-beam bridge to suit the following data: 14M
- Clear width of roadway : 7.5 m
 - Span (c/c of bearings) : 10 m
 - Live load : I.R.C. Class AA tracked vehicle
 - Average thickness of wearing coat = 75 mm
 - Concrete mix : M30 grade
 - Steel : Fe415 grade HYSD bars

(OR)

8. Design a RCC T-beam bridge to suit the following data: 14M
- Clear width of roadway : 7.5 m
 - Span (c/c of bearings) : 15 m
 - Live load : I.R.C. Class AA tracked vehicle
 - Average thickness of wearing coat = 80 mm
 - Concrete mix : M25 grade
 - Steel : Fe415 grade HYSD bars
- Using Courbon's method. Design the deck slab, main girder and cross girders. Assume suitable data if any required.

UNIT-V

9. (a) Explain the design procedure for mild steel rocker bearing? 7M
- (b) Write about the advantages and disadvantages of Steel Rocker Bearings and Elastomeric Pad Bearings 7M
- (OR)**
10. (a) Write about the various forces acting on the piers. 7M
- (b) Discuss about the various types of Wing Walls. 7M

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: FINITE ELEMENT METHOD (CE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) Explain about Finite Element Modeling and Discretization procedure. 9M
 (b) What are the limitations of finite element method? 5M

(OR)

2. (a) Write the equilibrium equations in elasticity subjected to body force 4M
 (b) Write a note on node numbering and half band width. 10M

UNIT - II

3. Calculate the nodal displacements and the internal member forces for each of the beam loadings shown **Fig. 1 (a-d)**. Construct the shear force and bending moment diagram for each member. Take $E=200$ GPa and $I=0.8 \times 10^{-4} \text{ m}^4$. 14M

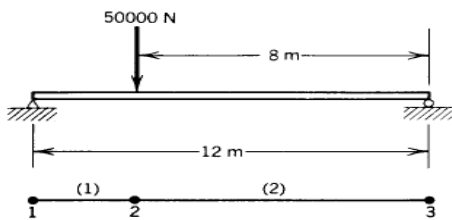


Fig. 1(a)

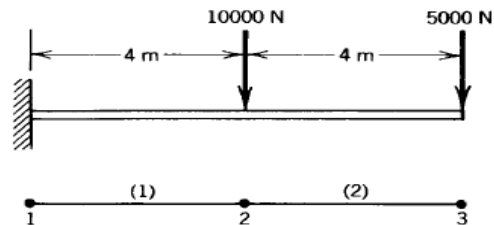


Fig. 1(b)

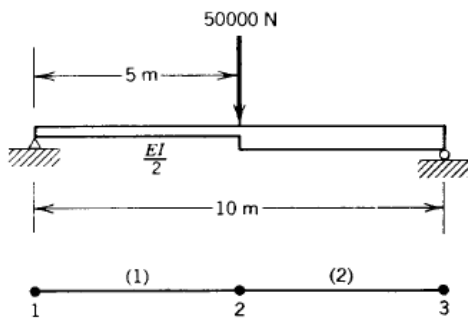


Fig. 1(c)

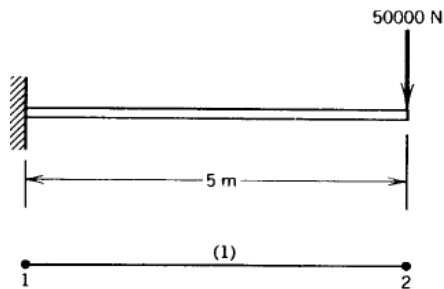


Fig. 1(d)

(OR)

4. (a) For the two-bar truss shown in **Fig. 2**, determine the displacements, stress in each element and reactions at the support. Length is in 'mm'. 10M

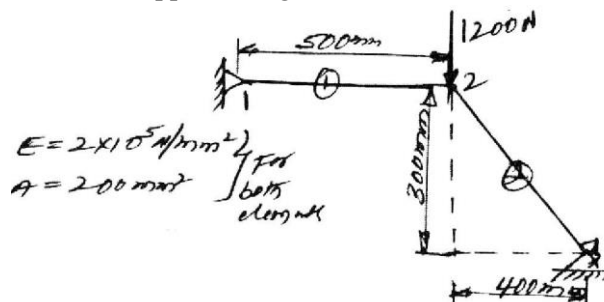
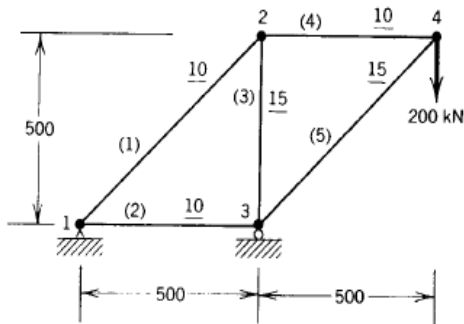


Fig. 2

- (b) What are the convergent and compatibility requirements for shape functions? 4M

UNIT – III

5. The displacements for the truss shown in **Fig. 3** are given below. The cross-sectional area of each member in cm^2 is underlined. Each member is made of steel, $E = 20 \times 10^6 \text{ N/cm}^2$. All lengths are given in centimetres. Calculate the axial force in each member. 14M



$$\begin{aligned}
 U_1 &= 0.0 & U_2 &= 0.0 \\
 U_3 &= 1.748 & U_4 &= -0.3333 \\
 U_5 &= -0.5000 & U_6 &= 0.0 \\
 U_7 &= 2.248 & U_8 &= -3.690
 \end{aligned}$$

Fig. 3
(OR)

6. Use the finite element method to solve the plane truss shown in **Fig. 4**. Assume $AE = 10^6 \text{ N}$, $L = 1\text{m}$. Determine the nodal displacements, element forces in each element, and the support reactions. 14M

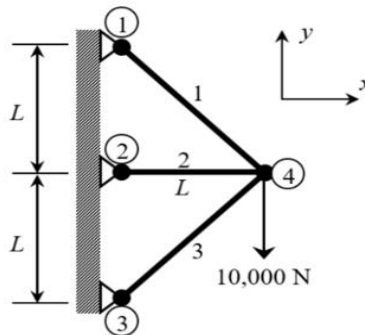


Fig. 4

UNIT – IV

7. A cantilever beam is subjected to point load of 300 kN as shown in **Fig. 5**. Determine the deflection at tip and support reaction. $E = 210 \text{ GPa}$, $I = 4 \times 10^6 \text{ mm}^4$, $l_e = 0.9 \text{ m}$. 14M

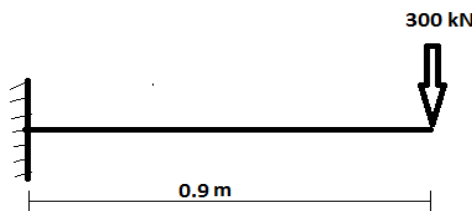


Fig. 5

(OR)

8. (a) Derive shape functions for a beam element. 6M
 (b) Discuss about Plane strain analysis of a beam. 8M

UNIT-V

9. On a four nodal quadrilateral plane stress element the nodes are (0, 0), (6, 2), (6, 6) and (1, 5). A concentrated load whose x and y components are 10 kN, 16 kN respectively is applied at a point (4, 5). Find the equivalent nodal forces and the displacement of nodes. 14M

(OR)

10. (a) Discuss briefly about Numerical integration and static condensation solution techniques 10M
 (b) Discuss briefly about assembly of elements for static loads 4M

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SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: QUANTITY SURVEYING AND VALUATION (CE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) What are the standard specifications for (i) Brick work and (ii) Reinforced concrete. 7M
(b) Distinguish between the General and Detailed specifications. 7M

(OR)

2. (a) What are the general specifications of a Second Class Building ? 7M
(b) Explain the methods of estimates. 7M

UNIT – II

3. (a) Prepare the rate chart for R.C.C. work in Beams, Slabs, etc. in 1 : 2 : 4 - 10 cu. m.. 7M
(b) Prepare the rate chart for 2.5 cm Cement Concrete Floor with 1 : 2 : 4 - 100 sq. m. 7M

(OR)

4. (a) Prepare the rate chart for 2.5 cm thick Premix Bituminous Road - 100 cu. m. 7M
(b) Prepare the rate chart for Earthwork in Excavation in trenches up to 1.5 m depth for laying sewers in ordinary soil in 20 cm layers - 100 cu.m. 7M

UNIT – III

5. Estimate the quantities of following item of works from the Single-roomed Building shown in Fig. 1. a) Earthwork in Excavation in foundation b) Lime concrete in foundation c) 1st class brickwork in superstructure in lime mortar. 14M

(OR)

6. Estimate the quantities of following item of works from the Two-roomed Building shown in Fig. 2. a) Earthwork in Excavation in foundation b) Lime concrete in foundation c) 1st class brickwork in Foundation and Plinth in 1 : 6 cement mortar. 14M

UNIT – IV

7. Prepare a detailed estimate of R.C.C. Roof Slab given in Fig. 3. 14M

(OR)

8. Prepare a detailed estimate of R.C.C. Staircase given in Fig. 4. 14M

UNIT-V

9. (a) Briefly explain the conditions of contract. 7M
(b) Define tender and prepare Letter of tender. 7M

(OR)

10. (a) Define valuation and discuss its purpose for various requirements. 7M
(b) Explain any two methods of calculating depreciation. 7M

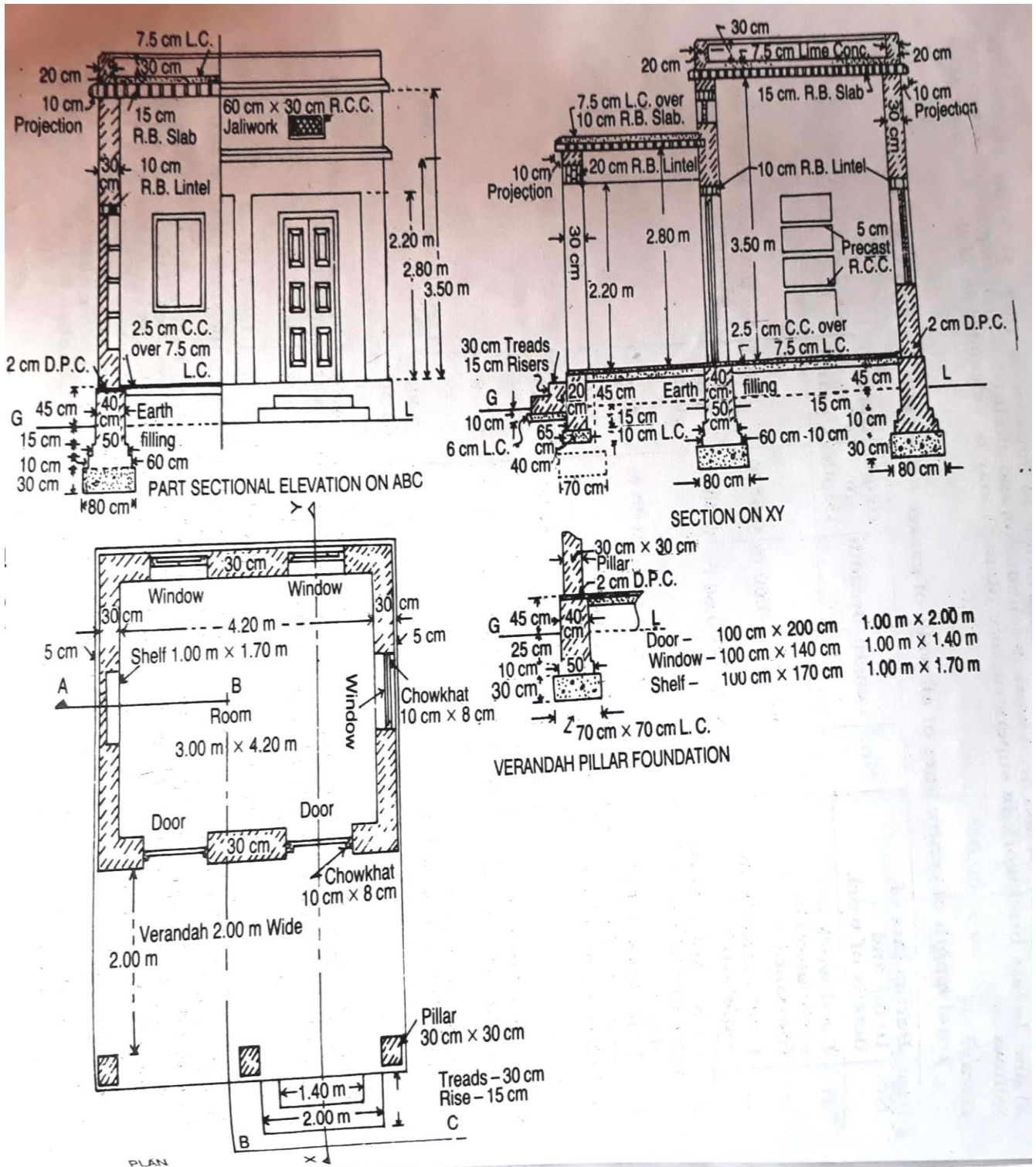


Fig. 1.

TWO-ROOM BUILDING WITH FRONT VERANDAH

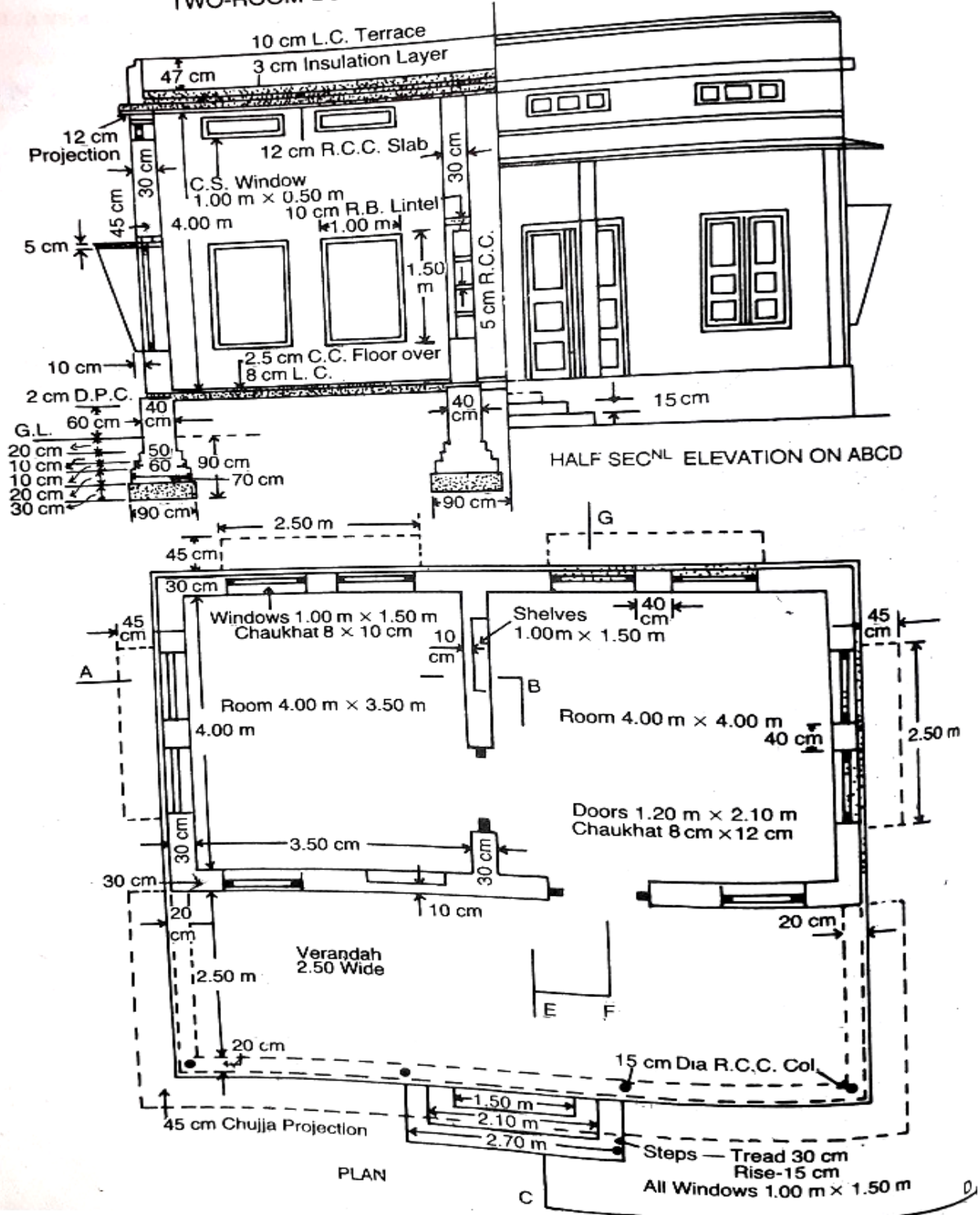


Fig. 2.

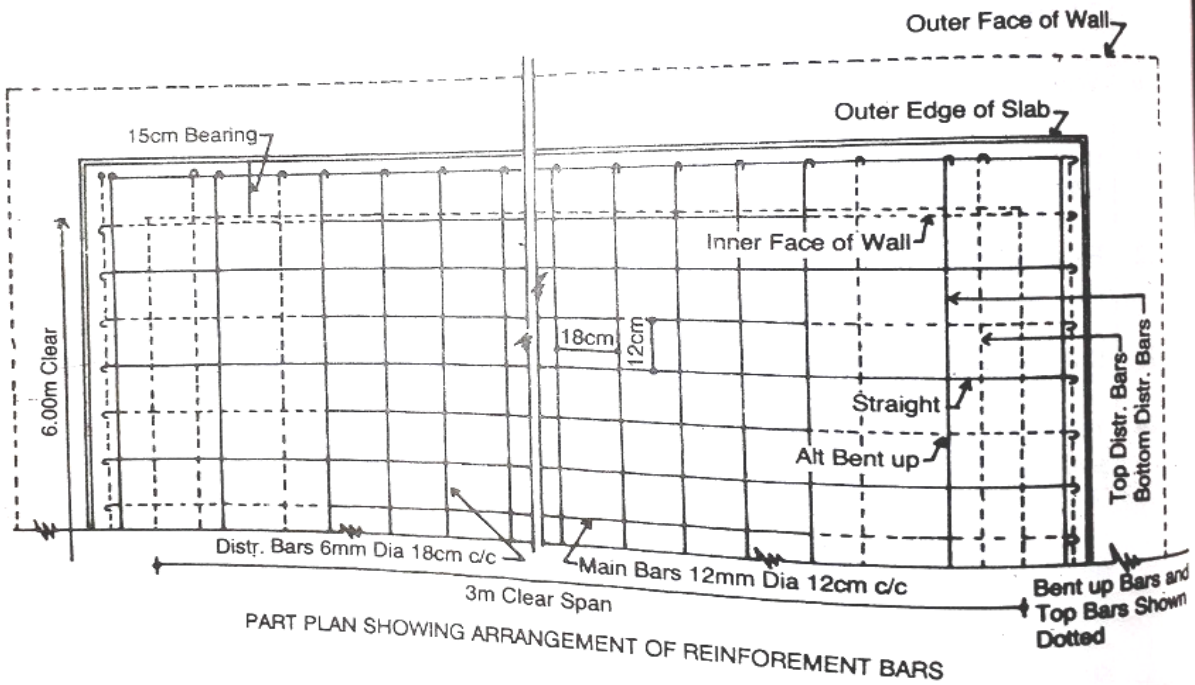
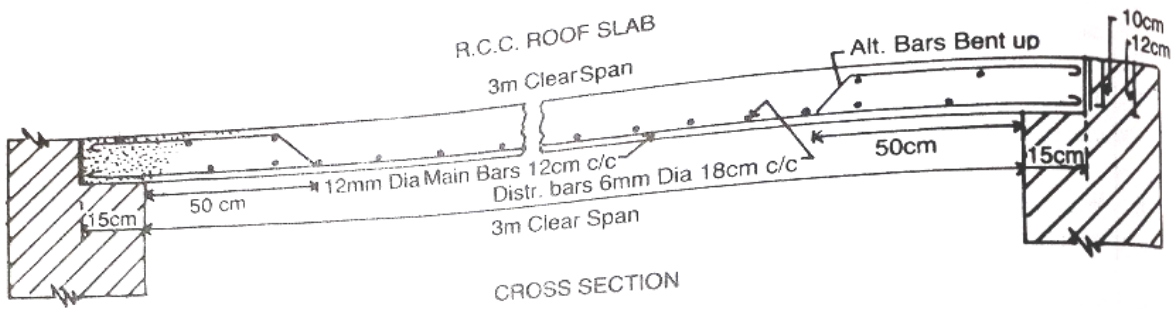


Fig. 3.

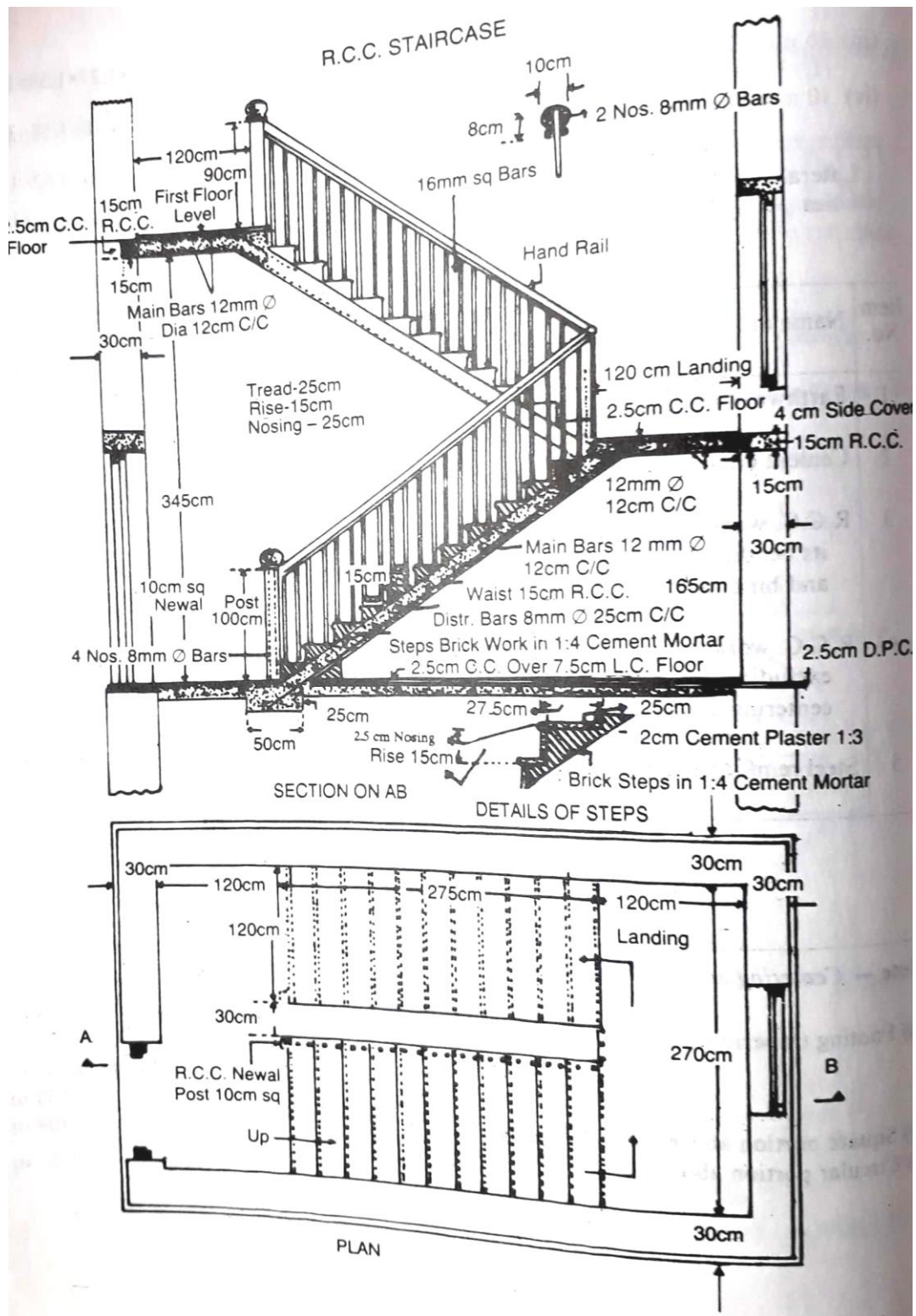


Fig. 4.

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SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: DESIGN & DRAWING OF IRRIGATION STRUCTURES (CE)

Time : 3 Hours

Max. Marks: 70

Note: Answer any ONE question. Assume any missing data

1. Design a canal drop (notch type) of 2 m with the following data

Hydraulic Particulars	Upstream Side	Downstream side
Full Supply discharge	4 cumecs	4 cumecs
Bed width	6 meters	6 meters
Bed level	+10.00	+8.00
Full supply depth (F.S.D)	1.5meters	1.5meters
Full Supply Level (F.S.L)	+11.50	+9.50
Top of bank level (T.B.L)	+12.50	+10.50

The Ground level at the site of work is + 10.50
Good soil is available for foundation at + 8.50
Draw to a suitable scale the following

- (a) Longitudinal section and (b) Half plan at top and half plan at foundation level

2. Design a sluice taking off from a tank irrigating 200 hectares at 1000 duty. The tank bund through which the sluice is taking off has a top width of 2 m with 2:1 side slopes. The top level of bank is + 40.00 and the ground level at site is + 34.50 Good hard soil for foundation is available at + 33.50.

The sill of the sluice at off take is + 34.00.

The maximum water level in tank is 38.00. The full tank level is + 37.00. Average low water level of the tank is + 35.00. The details of the canal below the sluice are as under

Bed level is + 34.00

F.S.L + 34.50

Bed width is 1.25 m

Slide slopes 1 1/2 to 1 with top of bank at + 35.50

Draw to a suitable scale the following

- (a) Longitudinal section and
(b) Half plan at top and half plan at foundation level

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SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: SANITARY ENGINEERING (CE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT - I

1. (a) Explain the Importance of Average, Peak and Minimum Sewage flow in the design of sewer network and treatment Systems. 7M
(b) The drainage area of one sector of a town is 100 hectares and the population is 50,000. If the time of concentration for the area is 25 minutes and coefficient of surface runoff is 0.45, find the maximum quantity of sewage from drainage area. 7M

(OR)

2. (a) Explain the separate and combined sewerage system with merits and demerits. 7M
(b) What are the various sewer appurtenances? Discuss in detail about manhole. 7M

UNIT – II

3. (a) What is BOD? Explain the importance of BOD/COD ratio. 7M
(b) Determine 5 day BOD of sample at 20°C, if its 1 day BOD at 20°C is 150 mg/l. Assume constant rate K_D at 20°C is 0.1/day. 7M

(OR)

4. (a) Explain the layout and general outline basic concept of domestic sewage treatment plant. 7M
(b) Write short notes on various types of screens. 7M

UNIT – III

5. (a) Explain the necessity of secondary treatment in sewage treatment. 6M
(b) Design an Activated sludge plant to treat domestic sewage, based on the following data 8M
Population : 50,000
Average sewage flow : 120 lpcd
BOD of sewage Influent : 200 mg/lit
MLSS : 2000 mg/lit
F/M ratio : 0.3

(OR)

6. (a) Write short notes on Aerated Lagoons. 7M
(b) Design a secondary sedimentation tank to treat 5 MLD of sewage. Assume suitable data. 7M

UNIT – IV

7. (a) Write a note on removal of phosphorus from sewage 8M
(b) Explain the standards for disposal of treated sewage into inland surface waters 6M

(OR)

8. (a) With the help of neat sketches describe the sludge digestion tank. 7M
(b) Design a septic tank for 100 users, assuming the rate of water supply as 120 lpd. 7M

UNIT-V

9. (a) Discuss in brief various methods of collection of solid waste. 7M
(b) What are the various methods of solid waste disposal? Discuss about sanitary land fill in detail. 7M

(OR)

10. (a) Explain the air quality standards and limits. 7M
(b) Explain the methods of noise pollution control. 7M

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: RELIABILITY ENGINEERING & APPLICATION TO POWER SYSTEMS
(EEE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT - I

1. (a) Derive the expressions for the expected value, variance and standard deviation of Binomial Distribution. 7M
 - (b) Summarize the advantages of Bernoulli's trials using binomial distribution. 7M
- (OR)**
2. (a) How is the reliability evaluated for parallel series networks? 7M
 - (b) Evaluate the reliability of a series system consisting of 6 similar components each with a probability of 0.9. 7M

UNIT – II

3. (a) Define the terms MTTF, MTTR & MTBF. 9M
 - (b) What is exponential distribution? Explain its significance. 5M
- (OR)**
4. (a) Explain in detail the reliability functions $f(t)$, $F(t)$, $R(t)$ & $h(t)$ and also derive the relationship among them. 8M
 - (b) A component with an MTTF of 100 hours is known to have exponential distribution. Calculate the reliability of the component for a mission time of 10 hours. 6M

UNIT – III

5. What is STPM? How is it used for evaluation of limiting state probabilities? Derive STPM for one component repairable system. 14M
- (OR)**
6. (a) Summarize the concept of Markov chains. 7M
 - (b) Discuss about two component repairable models. 7M

UNIT – IV

7. (a) What is cumulative probability? 7M
 - (b) Evaluate the frequency of encountering states for one component repairable model. 7M
- (OR)**
8. (a) A generating station consists of 2 X 25 MW & 1 X 50 MW respectively. Each unit has a failure rate of 0.01 f/day & repair rate of 0.49 r/day. If load data for a period of 365 days is given below then evaluate loss of load expectation? 8M

Daily Peak Load:	57	52	46	41	34	18
No . of occurrences:	12	83	107	116	47	40

- (b) Explain the method of calculating the LOEE of a generating system based on types of load curves. 6M

UNIT-V

9. (a) Explain about system and load point reliability indices for composite system. 7M
 - (b) Discuss in detail about customer oriented, loss and energy oriented indices. 7M
- (OR)**
10. (a) What is the need of consideration of weather effects in reliability evaluation? 8M
 - (b) Explain weighted average rate in detail. 6M

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: ELECTRICAL MACHINE DESIGN (EEE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT - I

1. (a) What are major considerations to evolve a good design of electrical machine? 6M
 (b) Determine the main dimensions of a 100 KVA, 2200/480V, 50Hz, single phase core type transformer. Find also the number of turns and cross-sectional area of primary and secondary conductors. Assume volt/turn as 7.5V, maximum flux density as 1.2 Wb/m². Ratio of effective cross-sectional area of to square of diameter of circumscribing circle is 0.6, ratio of height to width of window is 2, window space factor is 0.28 and current density is 2.5 A/mm². 8M

(OR)

2. (a) Prove the EMF/turn of a single phase transformer = $K\sqrt{Q}$ where Q=per phase KVA output of transformer. 6M
 (b) Estimate the i) core area ii) window area and iii) conductor area of cross-section of a three phase delta/star core type transformer rated at 300KVA, 6600/440V, 50Hz. A suitable core with three steps having a circumscribing circle of 0.25M diameter and a legs spacing of 0.4M is available. The emf per turn is 8.5V. Assume current density = 2.1 A/mm², window space factor = 0.25 and stacking factor = 0.9 8M

UNIT - II

3. (a) Derive the output equation of a D.C. machine and mention the usual values of specific loadings. 6M
 (b) Determine the number of poles, armature diameter and core length for the preliminary design of 500Kw, 400V, 600RPM, dc shunt generator assuming an average flux density in the air gap of 0.7T and specific electric loading of 38400 ampere-conductors per meter. Assume core length/pole arc = 1.1. Apply suitable checks. 8M

(OR)

4. (a) List out the procedure involved in design of shunt field winding of d.c. machine. 6M
 (b) Calculate the apparent flux density at a particular section of the tooth from the following design data: tooth width = 12mm, slot width = 10mm, gross core length = 0.32M, number of ventilating ducts = 4, each 10mm wide, real flux density = 2.2 Wb/m², permeability of teeth corresponding to real flux density = 31.4×10^{-6} H/m, stacking factor = 0.9. 8M

UNIT - III

5. (a) Explain the factors which influence the choice of Ampere conductors and B_{av} 6M
 (b) During the preliminary design of a 270KW, 3600V, three phase, 8-pole 50Hz slip ring induction motor the following design data have been obtained. Gross length of the stator core = 0.38M, internal diameter of the stator = 0.67M, outer diameter of the stator = 0.86M. No. of stator slots = 96, number of conductors/slot = 12. Based on the above information determine the following data for the motor. (i) flux per pole (ii) gap density (iii) conductor size (iv) size of the slot. 8M

(OR)

6. (a) Discuss the various considerations to be taken into account while selecting the 6M

number of rotor slots in squirrel cage induction motor.

- (b) Derive an expression for rotor bar current and end ring current of squirrel cage induction motor. 8M

UNIT – IV

7. (a) Define short circuit ratio of synchronous machine. How do you determine short circuit ratio? 6M
- (b) A 500 KVA, 3.3KV; 50Hz, 600 rpm, three phase salient pole alternator has 180 turns per phase. Estimate the length of air gap if the average flux density is 0.54 Wb/m^2 , the ratio of pole arc to pole pitch 0.66, the SCR 1.2. The gap contraction factor 1.15; winding factor 0.95. The mmf required for gap is 80% of no load field mmf and winding factor 0.95 8M

(OR)

8. (a) What are the factors that effect, selection of armature slots? 6M
- (b) Find the main dimensions of 2500 KVA, 187.5 rpm, 50Hz, three phase salient pole synchronous generator. The generator is to be vertical water wheel type. The specific magnetic loading is 0.6 Wb/m^2 and the specific electric loading is 34,000 A/M. Use circular poles with ratio of core length to pole pitch=0.65. Specify the type of pole construction used if the runaway speed is about two time's normal speed. 8M

UNIT-V

9. (a) The temperature rise-time curve of a transformer in which loss dissipated is constant shows that the rate of change of temperature rise is $0.465 \text{ }^\circ\text{C/min}$ and $0.327 \text{ }^\circ\text{C/min}$. When temperature rise is $27.1 \text{ }^\circ\text{C}$ and $34.7 \text{ }^\circ\text{C}$ respectively. Find the final steady temperature rise and heating time constant of transformer. 8M
- (b) The full load efficiency of a 120MW hydrogen cooled turbo synchronous machine is 99%. The hydrogen enters with a temperature of $25 \text{ }^\circ\text{C}$ and leaves the machine at temperature of $55 \text{ }^\circ\text{C}$. Determine the volume of the coolant at a pressure of 1450mm above the gauge pressure. 6M

(OR)

10. The tank of a 1250KVA natural oil cooled transformer has the dimensions length, width and height as 1.55M, 0.65M and 1.85M respectively. The full load loss is 13KW. Find the number of cooling tubes for this transformer assuming loss dissipated due to provision of tubes=40%, temperature limitation= $40 \text{ }^\circ\text{C}$, length of the tubes=1M, diameter of the tubes=5cm. Neglect top and bottom surfaces for cooling. 14M

Q.P. Code: 353212

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B.Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: FLEXIBLE AC TRANSMISSION SYSTEMS (EEE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT - I

1. (a) Explain the objectives of FACTS controllers in the power system network. 7M
(b) Briefly discuss about the basic types of FACTS controllers 7M

(OR)

2. (a) Using two machine approach, discuss the dynamic stability aspects of power systems. 10M
(b) Discuss the benefits of FACTS Controller 4M

UNIT – II

3. (a) With a neat circuit diagram and necessary waveforms, discuss the working of a single-phase bridge converter. 7M
(b) Explain the principle of a voltage sourced converter. Why voltage sourced converters are preferred than current sourced converters for FACTS application? 7M

(OR)

4. (a) Illustrate how end of line voltage support improves voltage stability in radial lines. 7M
(b) Comparison between voltage sourced and current sourced converters. 7M

UNIT – III

5. (a) Briefly describe the way by which the transient stability is enhanced due to static VAR compensator. 7M
(b) Explain about switching converter type VAR generators 7M

(OR)

6. (a) What are the objectives of reactive shunt compensation? 7M
(b) What are the methods of controllable VAR generation? With a neat schematic and waveforms, discuss the working of thyristor controlled reactor. 7M

UNIT – IV

7. (a) Draw and Explain the VI characteristics of SVC. 8M
(b) Write the assumptions of control coordination for damping enhancement? 6M

(OR)

8. (a) Compare the V-I Characteristic of STATCOM & SVC. 7M
(b) Discuss the benefits of STATCOM 7M

UNIT-V

9. (a) Explain how series compensation improves power transfer capacity of transmission line. 7M
(b) Describe the working of GTO thyristor controlled Series Capacitors. 7M

(OR)

10. (a) Explain about basic GTO-controlled series capacitor with principle of operation and necessary waveforms. 7M
(b) Explain different modes of operation of TCSC? 7M

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SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B.Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: UTILIZATION OF ELECTRICAL POWER (EEE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT - I

1. (a) Define the terms i) Luminous flux, ii) Luminous intensity iii) utilization factor iv) Illumination. 7M
(b) Explain the construction operation of a Fluorescent tube and compare it with tungsten Filament lamps. 7M

(OR)

2. With the help of circuit diagrams explain the working of the following light sources: 14M
i) Sodium vapour lamps, ii) Mercury vapour lamps.
iii) Incandescent lamps.

UNIT – II

3. (a) Write the requirements of a good heating material, and explain the design of heating element. 7M
(b) Explain with a neat sketch the operation and control methods of direct and indirect arc furnaces. 7M

(OR)

4. Describe with a neat sketch the various types of electric arc welding methods. 14M

UNIT – III

5. (a) What is meant by load equalization? Explain how this is achieved in electrical industry. 7M
(b) Discuss various types of loads and give examples of load which are functions of speed. 7M

(OR)

6. Discuss various methods of controlling the speed of a 3-phase induction motor. Draw the speed-torque characteristics in each case. 14M

UNIT – IV

7. (a) What are the various traction systems in practice in our country? Give the advantages of electric drives with its limitation. 7M
(b) Explain with the help of block diagram the construction and principle operation of a AC locomotive. 7M

(OR)

8. Write the short notes on the following: 14M
a) Electric breaking performance curve.
b) Blended brake performance curve.
c) Operators master controller.

UNIT-V

9. (a) Discuss the advantages and disadvantages of electric traction. 4M
(b) Explain the term tractive effort and co-efficient of adhesion. 5M
(c) Assuming Trapezoidal speed-time curve, derive equations for i) total distance travelled by the train between two stops, and ii) maximum velocity. 5M

(OR)

10. (a) Briefly explain the supply systems for electric traction. 4M
(b) It is proposed to put an electric trolley services in a city. the schedule speed is to be 45 kmph. the distance between stops is 2.8 km. the track is assumed to be level. each stop is of 30 sec duration. using simplified speed-time curve calculate the maximum speed assuming the acceleration to be 2 km/h/sec, and retardation to be 3.2 km/h/sec. The dead weight of the car is 16 tonnes rotational inertia is 10% of dead weight and track resistance is 40 newton's per tonne. If the overall efficiency is 80%, calculate i) maximum power output from driving axles, ii) the specific energy consumption. 10M

Q.P. Code: 452012

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: BIOMEDICAL INSTRUMENTATION (ECE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. With neat block diagram, explain the components of medical instrumentation systems. 14M
(OR)
2. (a) Discuss in detail about the static characteristics of medical instruments. 8M
(b) List out the problems encountered during measurements with human beings. 6M

UNIT – II

3. (a) Draw the structure of a living cell of our body and explain its constituent's in detail. 7M
(b) With reference to Nernst equation, explain the characteristics of resting potential. 7M
(OR)
4. (a) Explain conduction through nerve to neuromuscular junction 8M
(b) Describe the generation and features of action potential. 6M

UNIT – III

5. (a) Elucidate the electrical conduction system of heart. 9M
(b) Write in detail about Cardiac Cycle? 5M
(OR)
6. (a) Demonstrate the functioning of Biochemical Electrodes. 9M
(b) Differentiate between internal and external pace makers. 5M

UNIT – IV

7. Describe in detail about the clinical significance, lead configuration, recording methods and waveforms of ECG. 14M
(OR)
8. (a) Illustrate the working principle of Spirometer with neat diagram. 7M
(b) Discuss the type of Ventilators used in respiratory mechanism. 7M

UNIT-V

9. (a) Describe any four effects of electric current on the human body. 8M
(b) Explain the hazards in operation room. 6M
(OR)
10. (a) Demonstrate the patient isolation in safety mechanisms. 7M
(b) Summarize the precautions to minimize electric shock hazards. 7M

Q.P. Code: 453012

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: RADAR SYSTEMS (ECE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT – I

1. (a) Derive the radar range equation. 7M
(b) Calculate the maximum range of a radar system which operates at 3cm with a peak pulse power of 500 kw, if its minimum receivable power is 10^{-13} w. The capture area of its antenna is 4m^2 and the radar cross sectional area of the target is 20m^2 . 7M
- (OR)
2. (a) Explain in detail about pulse repetition frequency and range ambiguities. 6M
(b) Consider a radar with pulse repetition frequency 1000 Hz. (i) Find the time duration between two pulses. (ii) Suppose an echo from a distant object is received 20μ sec after a pulse is transmitted, what is the distance of the object from the radar? (iii) Is there a second -time-around echo from this object? 8M

UNIT – II

3. (a) With the aid of a sketch showing a typical display, explain fully the PPI radar indicator, why is this method called intensity modulation? 7M
(b) Describe the function of the more important controls that may be provided with an A scope radar display. 7M
- (OR)
4. Explain the following i) TWT amplifier, ii) Duplexers, iii) Noise figure, iv) Mixers 14M

UNIT – III

5. (a) Explain in detail about multiple frequency CW radar. 8M
(b) With a CW transmit frequency of 5GHz, calculate the Doppler frequency seen by a stationary radar when the target radial velocity is 100km/h. 6M
- (OR)
6. (a) Explain with a neat diagram about sequential lobing. 7M
(b) An MTI radar operates at 5GHz, with a pulse repetition frequency of 800pps. Calculate the lowest three blind speeds of the radar. 7M

UNIT – IV

7. Explain the following i) Direction finding using loop antenna, ii) Errors in direction finding. 14M

(OR)

8. Explain i) Goniometer, ii) VOR receiving equipment. 14M

UNIT-V

9. Explain the operation and typical applications of i) LORAN-A, ii) LORAN-C, iii) DME 14M

(OR)

10. (a) Discuss various types of hyperbolic systems of navigation. 7M
(b) Write about TACAN equipment. 7M

Q.P. Code: 453212

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: SATELLITE COMMUNICATIONS (ECE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) Draw the block diagram of satellite communication system and explain 10M
(b) Discuss the applications of satellite communications 4M
(OR)
2. (a) Explain about launches and launch vehicles 7M
(b) What are the orbital perturbations and effect of non spherical earth 7M

UNIT – II

3. Discuss in detail about the attitude and orbit control system (AOCS) 14M
(OR)
4. (a) Explain telemetry, tracking and command in satellite systems 7M
(b) Explain about space craft antennas 7M

UNIT – III

5. (a) Explain the design of down links for satellite communications 7M
(b) Why uplink frequency is different from downlink frequency in satellite communication? Discuss. 7M
(OR)
6. (a) Discuss the design of satellite links for specified C/N? 7M
(b) Explain the design of up links for satellite communications 7M

UNIT – IV

7. (a) Explain the time division multiple access (TDMA) frame structure 7M
(b) Briefly explain the process of spread spectrum transmission and reception 7M
(OR)
8. (a) Explain the concept of demand access multiple access 7M
(b) Explain the concept of demand assignment TDMA 7M

UNIT-V

9. (a) Explain how small antennas can be designed on earth station 10M
(b) Write short notes on earth station antenna tracking system 4M
(OR)
10. Draw the block diagram earth station and explain the function of each block 14M

Q.P. Code: 453412

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: CELLULAR & MOBILE COMMUNICATIONS (ECE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) Explain the basic cellular system with neat diagram. 7M
(b) What is the concept of frequency reuse channels? 7M
(OR)
2. (a) What are the limitations of conventional Mobile Telephone System? 4M
(b) With a neat sketch, explain the operation of a cellular system 10M

UNIT – II

3. Describe 14M
(a) Foliage loss, (b) long distance propagation, (c) Cell-site antenna heights
(OR)
4. (a) Derive the expression for received power P_r in the wave propagating from land to mobile over land. 10M
(b) The distance between two fixed stations is 20Km. The effective antenna height at one end is 100m. Find the effective antenna height at the other end at 850 MHz to receive maximum power. 4M

UNIT – III

5. (a) Write short notes on Umbrella pattern antennas. 4M
(b) Explain the design of a directional antenna system. 10M
(OR)
6. (a) How interference can be reduced by using the directional antennas at cell site. 7M
(b) Write the short notes on spaced diversity antennas. 7M

UNIT – IV

7. (a) Explain The factors included in Dropped call rate evaluation 7M
(b) Explain Handoff & their characteristics 7M
(OR)
8. (a) Explain the concept of channel sharing and borrowing. 7M
(b) Write short notes on channel assignment. 7M

UNIT-V

9. (a) Explain the GSM architecture. 8M
(b) Explain about the GSM Channels. 6M
(OR)
10. What is TDMA? Explain TDMA architecture with neat diagram 14M

Q.P. Code: 552412

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: GEOMETRIC MODELLING (ME)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) Explain the functioning of Color CRT using Shadow mask technique. 7M
(b) Describe about the functioning of Plasma display devices. 7M

(OR)

2. (a) Briefly explain about region filling with examples 7M
(b) Briefly explain about flood filling algorithm & boundary fill algorithm 7M

UNIT – II

3. Explain the algorithm for line clipping by Cohen-Sutherland algorithm. Demonstrate with an example all the three cases of lines 14M

(OR)

4. (a) Explain about Sutherland-Hodgman algorithm for polygonal clipping in detail 9M
(b) List out the characters of polygon clipping 5M

UNIT – III

5. What do you mean by curve representation? Explain about Hermite cubic spline curve 14M

(OR)

6. Briefly explain about Bezier and B-Spline surface 14M

UNIT – IV

7. Drive the matrix form for the geometric transformations in 2-D graphics for the following operations with an example: 14M

(i) Translation, (ii) Rotation, (iii) Scaling

(OR)

8. (a) A point has coordinates in the x, y, z direction i.e., (5, 6, 7). The translation is done in the x-direction by 3 coordinate and y direction. Three coordinates and in the z-direction by two coordinates. Shift the object. Find coordinates of the new position. 7M

- (b) What is meant by composite transformations? 7M

UNIT-V

9. (a) Explain about constant intensity algorithm with neat sketch. 7M

- (b) Explain gouraud shading algorithm with neat sketch 7M

(OR)

10. (a) Why we have to remove hidden surfaces in order to construct a realistic view of 3D diagram. 4M

- (b) Explain about scan-line and depth sorting algorithm. 10M

Q.P. Code: 552612

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: GAS TURBINES AND JET PROPULSION (ME)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT - I

1. (a) Explain the working principle of Simple gas turbine cycle with a neat sketch. 7M
(b) In a gas turbine plant, air enters the compressor at 1 bar and 270° C. The pressure ratio is 6. 7M
The temperature at turbine inlet is 1000 K. The mass flow rate of air is 10Kg/s. Determine:
(i) Power required to drive the compressor and the turbine power output
(ii) The ratio of the turbine to compressor work
(iii) The net power developed by the plant and (iv) The thermal efficiency
(OR)
2. (a) What are the methods to improve the efficiency of a gas turbine cycle? Explain any one with neat sketch. 7M
(b) The pressure ratio of an open cycle gas turbine power plant is 5.6. Air is taken at 30°C and 1 bar. The compression is carried out in two stages with perfect inter cooling in between. The maximum temperature of the cycle is limited to 700°C. Assuming the Isentropic efficiency of each compressor stages as 85% and that of turbine as 90%, determine the power developed and efficiency of the power plant, if the air flow is 1.2Kg/s. The mass of the fuel may be neglected. $C_p=1.02\text{KJ/Kg-K}$, $\gamma=1.41$. 7M

UNIT – II

3. (a) Explain the principle of jet propulsion and mention how the jet propulsion engines are classified. 7M
(b) What are the essential features of propulsion devices? 7M
(OR)
4. (a) Derive an expression for thrust, thrust power and propulsive efficiency of jet propulsive engine. 7M
(b) Draw the layout of a turbojet engine 7M

UNIT – III

5. (a) Explain the working of a turboprop engine. 7M
(b) Explain thrust augmentation in turbojet engine. 7M
(OR)
6. The following data pertain to a turbo-jet flying at an altitude 9000 m; Speed of the turbo-jet=800km/h, Propulsive efficiency=55%; Overall efficiency of the turbine plant=17%, Density of air at 9000m altitude =0.17kg/m³; Drag on the lane -6000N. Assuming calorific value of the fuels used as 47000 kJ/kg. Calculate: 14M
(i) Absolute velocity of the jet, (ii) Volume of air compressed per minute, (iii) Diameter of the jet, (iv) Power output of the unit, (v) Air-fuel ratio

UNIT – IV

7. (a) Explain the working principle of ram jet engine with a neat sketch and derive an expression of thrust for ramjet engine. 14M
(OR)
8. (a) With the aid of a schematic diagram explain the working of pulse jet engine and also draw the ideal and actual P-V diagram. 7M
(b) Mention the various advantages and disadvantages of the pulse jet engine. 7M

UNIT-V

9. (a) Explain the working principle of rocket propulsion. 7M
(b) Explain about staging of rockets 7M
(OR)
10. (a) What are the desirable requirements of a liquid propellant for rockets? 7M
(b) Compare air breathing engines and rocket engines. 7M

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: RENEWABLE ENERGY SOURCES (ME)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) How do you calculate solar Radiation on tilted surface? 5M
(b) Explain the significance of energy consumption as prosperity. Write the different types of energy sources with examples. 9M
- (OR)
2. (a) List out the steps involved in the calculation of local solar time and day length and give needed formulae. 7M
(b) What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere? 7M

UNIT – II

3. (a) State the advantages and limitations of concentrated collector over the flat plate collector. 7M
(b) With a neat diagram, Explain the power generation system using solar pond. 7M
- (OR)
4. (a) With a neat diagram, Explain the working of a solar cooker. 7M
(b) With a neat diagram, Explain the working of a solar furnace. 7M

UNIT – III

5. (a) Explain the advantages and limitations of wind energy conversion systems. 7M
(b) With a neat diagram, explain the working principle of Biogas plant. 7M
- (OR)
6. (a) With a suitable block diagram, explain the functions of different components of wind energy conversion system. 7M
(b) Explain the working of Janata Model Biogas plant. 7M

UNIT – IV

7. (a) With a neat diagram, explain OTEC Rankine cycle. 8M
(b) List the benefits of a measure of the value of OTEC 6M
- (OR)
8. (a) With a neat diagram, Explain the principle of Tidal power generation. 9M
(b) Discuss about the problems faced in exploiting Tidal energy. 5M

UNIT-V

9. (a) Draw the line diagram and Explain the working of Hydrogen fuel cell. 7M
(b) Explain the working details of MHD accelerator. 7M
- (OR)
10. (a) What are the advantages and disadvantages of small Hydro power plants? 7M
(b) What is meant by Electron gas dynamic conversion and where do you use this principle. 7M

Q.P. Code: 553012

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: AUTOMATION & ROBOTICS (ME)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT – I

1. (a) Define automation. List the need for automation. 7M
(b) List the basic elements of automated system and explain any one 7M
(OR)
2. Outline a few salient points clearly distinguishing automation at the following levels: 14M
(i) Device level, (ii) Machine level, (iii) Cell level

UNIT – II

3. With neat diagrams, explain the different configurations of automated flow lines. 14M
(OR)
4. Briefly describe the following two cases of storage buffer effectiveness: 14M
(i) No buffer storage capacity at all
(ii) Infinite-capacity storage buffers

UNIT – III

5. (a) Briefly explain the different types of robots. 7M
(b) Describe the types of joints used in robots. 7M
(OR)
6. (a) What are the factors considered in designing and selection of the grippers? 7M
(b) Define degree of freedom for a robot joint? Explain various robot characteristics. 7M

UNIT – IV

7. (a) What are homogeneous transformations in Robot kinematics? For a vector $20\mathbf{i} + 25\mathbf{j} + 10\mathbf{k}$, perform a translation by a distance of 8 units in x direction, 7 units in y direction and 4 units in z direction. 9M
(b) Explain forward kinematics of a Robot? 5M
(OR)
8. Explain trajectory planning system with reference to robots. 14M

UNIT-V

9. (a) Explain Pneumatic actuators system with neat sketch 7M
(b) Explain the working of a stepper motor. 7M
(OR)
10. Give the different applications of robot in manufacturing industries. 14M

Q.P. Code: 652812

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: DIGITAL IMAGE PROCESSING (CSE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) Explain the digitization process of images. 7M
(b) In digital transmission, how many minutes it would take to transmit a digital image of size 2048x2048 with 128 grey levels in the form of packets at a baud rate of 3000? 7M

(OR)

2. (a) What are the different image formats? 7M
(b) Distinguish between binary, grey and color images. 7M

UNIT – II

3. (a) What is the significance of median, max and min filters in image restoration? 7M
(b) Explain about periodic noise filtering by frequency domain filtering. 7M

(OR)

4. (a) Explain about arithmetic and geometric mean filters. 7M
(b) What are the different noise models in image restoration process? 7M

UNIT – III

5. (a) Distinguish between CMY and YIQ color models. 7M
(b) Which are the logic operations involved in binary images? Explain. 7M

(OR)

6. (a) Distinguish between RGB and HIS color models. 7M
(b) How dilation is different from erosion? Explain. 7M

UNIT – IV

7. (a) Explain in detail about region based segmentation methods. 7M
(b) Describe the gradient operators based edge detection with necessary equations and masks. 7M

(OR)

8. (a) Which the threshold based segmentation methods are used? Explain. 7M
(b) Explain different edge detection techniques. 7M

UNIT-V

9. (a) Consider two matrices $A = \begin{bmatrix} 1 & 4 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$. Find the Kronecker product. 7M
(b) Show that the DCT is orthogonal transform (assume N=4). 7M

(OR)

10. (a) Compare different image compression methods 7M
(b) Distinguish between JPEG and MPEG compression methods. 7M

Q.P. Code: 653012

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: MANAGEMENT SCIENCE (CSE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.

All questions carry Equal Marks.

UNIT - I

1. How do you implement MBO in an organization? Draw a flow chart and also discuss about its benefits and weaknesses? 14M

(OR)

2. Briefly explain the differences between management and administration with suitable illustrations. 14M

UNIT – II

3. What are the factors affecting Plant location and Plant Layout. Explain the concept related to organization? 14M

(OR)

4. Briefly explain SWOT Analysis and its Merits and Demerits? 14M

UNIT – III

5. What is Man power planning? What are its objectives and importance? 14M

(OR)

6. List out the reasons for maintaining store records? Briefly explain the Purchase Procedure? 14M

UNIT – IV

7. Write a short note on Job, Batch and Mass Production? 14M

(OR)

8. Explain Statistical Quality Control and represent the charts with suitable examples? 14M

UNIT-V

9. (a) Write short notes on Cost Analysis? 7M

- (b) What is Project Crashing? 7M

(OR)

10. Draw a network diagram for the given table. 14M

Activity	A	B	C	D	E	F	G	H	I	J	K	L
Installation performance	–	A	B	A	D	C,E	D	D	H	H	F,H	G,J

Q.P. Code: 653212

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: ETHICAL HACKING (CSE)

Time : 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) Briefly explain Elements of Security? 7M
(b) How NeoTrace traces the path from the host system to any target system on the internet explain? 7M

(OR)

2. (a) What is Hacktivism and explain hacker classes? 7M
(b) Explain information gathering methodologies? 7M

UNIT – II

3. Explain Live System Scanning Tools in detail? 14M

(OR)

4. (a) Explain any three enumeration techniques? 7M
(b) Explain any four tools of scanning? 7M

UNIT – III

5. (a) Explain tools on Executing applications? 7M
(b) List out & explain Password Cracking Counter measures? 7M

(OR)

6. (a) Explain any six tools of Keyloggers? 7M
(b) Explain in detail NetBIOS Auditing Tool (NAT)? 7M

UNIT – IV

7. Explain in detail tools of Linux OS vulnerabilities? 14M

(OR)

8. (a) Write short notes on HTML fundamentals? 7M
(b) Write short notes on windows OS countermeasures? 7M

UNIT-V

9. Explain any six Types of Pen-Test Tools? 14M

(OR)

10. (a) Write any five phases of penetration testing? 7M
(b) Define penetration testing and explain types of penetration testing? 7M

Q.P. Code: 653412

SET - 2

K.S.R.M. COLLEGE OF ENGINEERING (AUTONOMOUS), KADAPA
B. Tech. VIII Sem. (R15) Advanced Supple. Examinations of November - 2020
SUB: SOFTWARE PROJECT MANAGEMENT (CSE)

Time: 3 Hours

Max. Marks: 70

Answer any FIVE Questions choosing one question from each unit.
All questions carry Equal Marks.

UNIT - I

1. (a) Explain the evolution of waterfall model in detail. 7M
(b) List out important trends in improving software economics. 7M

(OR)

2. (a) Write short notes on Boehm staffing principles. 7M
(b) How to reduce software product size? Explain in detail. 7M

UNIT – II

3. (a) Explain the life cycle phases of a process in detail. 7M
(b) Define Artifact. Write in detail about Engineering Artifacts. 7M

(OR)

4. (a) What are primary objectives and essential activities of inception phase? 7M
(b) Explain about technical perspective of model-based architecture. 7M

UNIT – III

5. (a) Explain the typical minor milestones in the lifecycle of iteration. 7M
(b) Write in detail about the iteration planning process throughout the life cycle. 7M

(OR)

6. (a) Draw and explain the workflow of an iteration in workflows of the process. 7M
(b) Write short notes on major milestones of a software process. 7M

UNIT – IV

7. (a) Write an overview of software project team evolution over the life cycle. 7M
(b) What are the Management Indicators recommended for a software project? 7M

(OR)

8. (a) Explain the primitive components of a software change order in project environment. 7M
(b) What are the tools available to automate the software development process? 7M

UNIT-V

9. (a) Discuss Next generation cost models in detail. 7M
(b) Exploit several critical approaches of modern process framework. 7M

(OR)

10. (a) What are the priorities for tailoring the process framework? 7M
(b) Explain about CCPDS-R life cycle overview in detail. 7M