

IV B.Tech I Semester Regular Examinations, November 2012
HIGH VOLTAGE ENGINEERING
(Electrical & Electronics Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. How is transformer insulation divided? Briefly indicate the insulation arrangement indicating the insulating materials chosen. [16]
2. Explain about various cathode processes that causes the electron emission in the gaseous medium of Townsend theory. [16]
3. (a) Explain the phenomena of thermal breakdown in solid dielectrics.
(b) Explain about the tracking in solid insulating materials. [8+8]
4. (a) Draw a typical impulse current generator circuit and explain its operation and application.
(b) A 12-Stage impulse generator has capacitors each rated at $0.3 \mu\text{F}$, 150 kV. The capacitance of the test specimen is 400 pF. Determine the wave front and wave tail Resistances to produce a $1.2/50 \mu\text{s}$ Impulse wave. Also determine the maximum output voltage if the charging voltage is 125 kV. [8+8]
5. (a) What are the conditions to be satisfied by a potential divider to be used for impulse work?
(b) Give the schematic arrangement of an impulse potential divider with an oscilloscope connected for measuring impulse voltages. Explain the arrangement used to minimize the errors? [8+8]
6. Give the mathematical models for lightning discharges and explain them. [16]
7. Explain the concept of apparent charge in partial discharge measurements. Describe a simple experiment technique to measure partial discharge [16]
8. Mention the different electrical tests done on isolators and circuits breakers. [16]

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1. Explain the application of paper based insulation and polymeric insulation in the construction of medium voltage (up to 33 kV) cables. [16]
2. Explain in detail about thermal breakdown mechanism in commercial liquids. [16]
3. Explain the breakdown mechanism in composite dielectrics due to aging and partial discharges. [16]
4. (a) Describe with a neat sketch, the working of a Van de Graaf generator
(b) What are the factors that limit maximum voltage applied? [8+8]
5. What are the problems associated with measuring very high impulse voltages? Explain how these can be taken care during measurements. [16]
6. (a) Explain the different theories of charge formation in clouds?
(b) What are the mechanisms by which lightning strokes develop and induce over voltages on overhead power lines? [8+8]
7. Explain the concept of apparent charge in partial discharge measurements. Describe a simple experiment technique to measure partial discharge [16]
8. Mention the different electrical tests done on isolators and circuits breakers. [16]

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1. Discuss about surge voltage and their distribution and control in high voltage power apparatus. [16]
2. Explain briefly various theories of breakdown in liquid dielectrics. [16]
3. Explain thermal breakdown in solid dielectrics. How this mechanism is more significant than the other mechanisms. [16]
4. (a) What is a Tesla coil? How are the damped high frequency oscillations are obtained form a Tesla coil?
(b) Draw the equivalent circuit of a four-stage cascaded transformer and determine the expression for the short-circuit reactance of the transformer. [8+8]
5. (a) Describe the generating voltmeter used for measuring high d.c voltages. How does it compare with a potential divider for measuring high dc currents.
(b) A generating voltmeter is to read 250kV with an indicating meter having a range of (0-20) μ A Calibrated accordingly . Calculate the capacitance of the generating voltmeter when the driving motor rotates at a constant speed of 1500 Rpm [8+8]
6. Explain the different aspects of insulation design and insulation co-ordination adopted for EHV systems? [16]
7. Explain the concept of apparent charge in partial discharge measurements. Describe a simple experiment technique to measure partial discharge [16]
8. Mention the different electrical tests done on isolators and circuits breakers. [16]

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1. Discuss the applications of solid insulating materials in high voltage power cables. [16]
2. State and explain Pachen's law. Derive the expressions for $(pd)_{min}$ and $(V_b)_{min}$. Assume $A=12$, $B=365$ and $\gamma=0.02$ for air. Determine the $(pd)_{min}$ and $(V_b)_{min}$. [16]
3. (a) Explain the phenomena of thermal breakdown in solid dielectrics.
(b) Explain about the tracking in solid insulating materials. [8+8]
4. (a) Explain and compare the performance of half wave rectifier and voltage double circuits for generation of high DC voltages.
(b) A 10 stage Cockroft - Walton circuit has all capacitors of $0.1 \mu F$. The secondary voltage of supply transformer is 11 kV at a frequency of 50 Hz. If the load current is 2 mA, find
 - i. the voltage regulation
 - ii. ripple voltage. [8+8]
5. (a) Describe the generating voltmeter used for measuring high d.c voltages. How does it compare with a potential divider for measuring high dc currents.
(b) A generating voltmeter is to read 250kV with an indicating meter having a range of $(0-20) \mu A$ Calibrated accordingly . Calculate the capacitance of the generating voltmeter when the driving motor rotates at a constant speed of 1500 Rpm [8+8]
6. Give the mathematical models for lightning discharges and explain them. [16]
7. What is non destructive testing of insulating materials? Give very briefly the characteristics of these methods. [16]
8. What is the significance of impulse tests? Explain briefly the impulse testing of insulators? [16]

IV B.Tech I Semester Regular Examinations, November 2012
ROBOTICS
(Mechanical Engineering)

Time: 3 hours**Max Marks: 80**

Answer any FIVE Questions
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1. (a) Explain about the five types of robot manipulators.
(b) What factors need to be taken into consideration when selecting a gripper for a particular task? [8+8]
2. (a) A part weighing 8lb is to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the fingers and the part surface is estimated to be 0.3. The orientation of the gripper will be such that the weight of the part will be applied in a direction parallel to the contacting finger surfaces. A fast work cycle is anticipated so that the 'g' factor to be used in force calculations should be 3.0 Compute the required gripper force for the specifications given.
(b) A vacuum gripper is to be designed to handle flat plate glass in an automobile wind shield plant. Each plate weighs 28lb. A single section cup will be used and the diameter of the suction cup is 60in. Determine the negative pressure required (compared to atmospheric pressure of 14.7 lb/sq.in) to lift each plate. Use a safety factor of 1.5 in your computation. [8+8]
3. (a) What is the rotation matrix for a rotation of 30^0 about OZ axis, followed by a rotation of 60^0 about the OX axis, followed by a rotation of 90^0 about the OY axis?
(b) Derive the formula for $\sin(\varphi+\theta)$ by expanding symbolically the rotation of φ and θ using the rotation matrix. [8+8]
4. A jointed-arm robot of configuration VVR is to move all three axes so that the first joint is rotated through 50^0 , the second joint is rotated through 90^0 and the third joint is rotated through 25^0 . Maximum speed of any of these rotational joints is $10^0/s$. Ignore effects of acceleration and deceleration.
(a) Determine the time required to move each joint if skew motion is used.
(b) Determine the time required to move the arm to the desired position and the rotational velocity of each joint, if joint-interpolated motion is used. [8+8]
5. (a) Discuss about the Jacobians in the force domain.
(b) Explain the determination of Jacobians with respect to frames attached to different links, when the Jacobian with respect to base frame is given. [8+8]
6. (a) Explain the End Effector commands of Robot languages.
(b) Discuss the Robot program synthesis. [8+8]

7. A certain dc servomotor used to actuate a robot joint has a torque constant of 3 N.m/A and a voltage constant of 15 V/kr/min (1 kr/min = 1000 r/min). The armature resistance is 3Ω . At a particular moment during the robot cycle, the joint is not moving and a voltage of 30 V is applied to the motor.
- (a) Determine the torque of the motor immediately after the voltage is applied.
 - (b) Determine the back - emf and the corresponding torque of the motor at 500 and 1000 r/min.
 - (c) If there were no resisting torques and no inductance of the armature windings operating to reduce the speed of the motor, determine the maximum theoretical speed of the motor when the input voltage is 30 V. [4+6+6]
8. (a) What are the applications of Robot in pick - and - place operations? Explain.
- (b) Discuss the features and capabilities of robots in spot welding? [8+8]

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1. (a) What is precision of movement of a robot? Explain the terms special resolution, accuracy and repeatability?
- (b) A robot with single degree of freedom has one sliding joint with a full range of 1.0m. The robot's control memory has a 12-bit storage capacity. Determine the control resolution for this axis of motion. [8+8]
2. (a) A part weighing 8lb is to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the fingers and the part surface is estimated to be 0.3. The orientation of the gripper will be such that the weight of the part will be applied in a direction parallel to the contacting finger surfaces. A fast work cycle is anticipated so that the 'g' factor to be used in force calculations should be 3.0 Compute the required gripper force for the specifications given.
- (b) A vacuum gripper is to be designed to handle flat plate glass in an automobile wind shield plant. Each plate weighs 28lb. A single section cup will be used and the diameter of the suction cup is 60in. Determine the negative pressure required (compared to atmospheric pressure of 14.7 lb/sq.in) to lift each plate. Use a safety factor of 1.5 in your computation. [8+8]
3. Draw and explain with an example the Composite rotations algorithm. [16]
4. Consider the Unimation PUMA 200 manipulator. This is a six-axis articulated robot with a roll-pitch-roll type of spherical wrist. Assign link coordinates using the first half of the D-H algorithm. Label the diagram with a's and d's as appropriate. [16]
5. Using Lagrange - Euler formulation, derive the expression for the joint Torques of a planar revolute jointed Robotic manipulator having unequal links. [16]
6. (a) Discuss the minimum time trajectories.
- (b) For a two - segments continuous - acceleration trajectory, the path points are $\theta^s = 10^0$, $\theta^e = 30^0$ and $\theta^m = 22^0$. The duration of two segments are 1.2 second and 1.0 second, respectively. Taking the velocity at via point as 15 deg/s, find the coefficients of the polynomials. [6+10]
7. A stepper stone motor is to be used to drive each of the three linear axes of a cartesian coordinate Robot. The motor output shaft will be connected to a screw thread with a screw pitch of 3 mm. It is desired that the control resolution of each of the axes be 0.6 mm.

- (a) To achieve this control resolution, how many step angles are required on the stepper motor?
- (b) What is the corresponding step angle?
- (c) Determine the pulse rate that will be required to drive a given joint at a velocity of 7.5 cm/sec. [4+4+8]
8. (a) Explain the Robotic parallel Assembly systems.
- (b) Explain the product designing for Robotic assembly. [8+8]

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1. (a) What is an end effector? Explain its function.
(b) Sketch 3 different types of grippers commonly used. [8+8]
2. (a) Explain the basic components of a robotic system.
(b) Explain the forward and reverse transformation of the 2-degrees of freedom arm. [6+10]
3. Consider the forward transformation of the two-joint manipulator shown in figure 3. Given that the length of joint 1, $L_1=12\text{in}$, the length of joint 2, $L_2=10\text{in}$., the angle $\theta_1=30^\circ$ and the angle $\theta_2=45^\circ$, compute the coordinate position (x and y coordinates) for the end-of-the-arm P_w . [16]

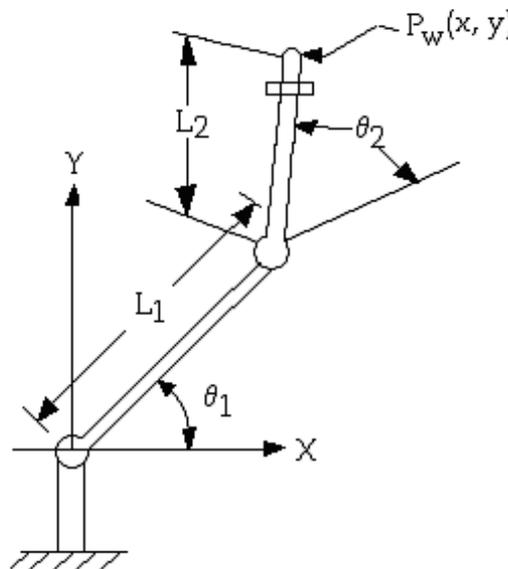


Figure 3

4. A jointed-arm robot of configuration VVR is to move all three axes so that the first joint is rotated through 50° , the second joint is rotated through 90° and the third joint is rotated through 25° . Maximum speed of any of these rotational joints is $10^\circ/\text{s}$. Ignore effects of acceleration and deceleration.
 - (a) Determine the time required to move each joint if skew motion is used.

- (b) Determine the time required to move the arm to the desired position and the rotational velocity of each joint, if joint-interpolated motion is used. [8+8]
5. Using Norton - Euler forward equations, determine the joint torques or forces of a planar RP robotic Manipulator. [16]
6. (a) Compare the Joint space and Cartesian space trajectory planning.
(b) The trajectory for a point - to - point motion between two points is divided into three segments and a 4 - 3- 4 trajectory plan is used. Determine the polynomial equations for the three segments. Assume appropriate constraints. [6+10]
7. A certain potentiometer is to be used as the feedback device to indicate position of the output link of a rotational Robot joint. The excitation voltage of the potentiometer equals 15 V and the total wiper travel of the potentiometer is 320° , the wiper arm is directly connected to the rotational joint so that the given rotation of the joint corresponds to an equal rotation of the wiper arm.
- (a) Determine the voltage constant of the potentiometer.
(b) The robot joint is actuated to a certain angle, causing the wiper position to be 38° . Determine the resulting output voltage of the potentiometer.
(c) In another actuation of the joint , the resulting output voltage of the potentiometer is 3.75 V. Determine the corresponding angular position of the wiper and the output link. [4+6+6]
8. (a) How Robotics can be used to perform inspection operation? Explain.
(b) Explain the Robot - manipulated inspection or Test equipment. [8+8]

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2. (a) A part weighing 8lb is to be held by a gripper using friction against two opposing fingers. The coefficient of friction between the fingers and the part surface is estimated to be 0.3. The orientation of the gripper will be such that the weight of the part will be applied in a direction parallel to the contacting finger surfaces. A fast work cycle is anticipated so that the 'g' factor to be used in force calculations should be 3.0 Compute the required gripper force for the specifications given.
(b) A vacuum gripper is to be designed to handle flat plate glass in an automobile wind shield plant. Each plate weighs 28lb. A single section cup will be used and the diameter of the suction cup is 60in. Determine the negative pressure required (compared to atmospheric pressure of 14.7 lb/sq.in) to lift each plate. Use a safety factor of 1.5 in your computation. [8+8]
3. Discuss the two coordinate systems used in the kinematic analysis of robotic arm with a suitable sketches. [16]
4. The joints and links of the RR: R manipulator in figure 4, figure 4 have the following values: $\theta_1=45^0$, $\theta_2=45^0$, $\theta_3= -135^0$, $L_1=500\text{mm}$, $L_2=400\text{mm}$ and $L_3=25\text{mm}$. Determine the values of x and z in world space coordinates. [16]

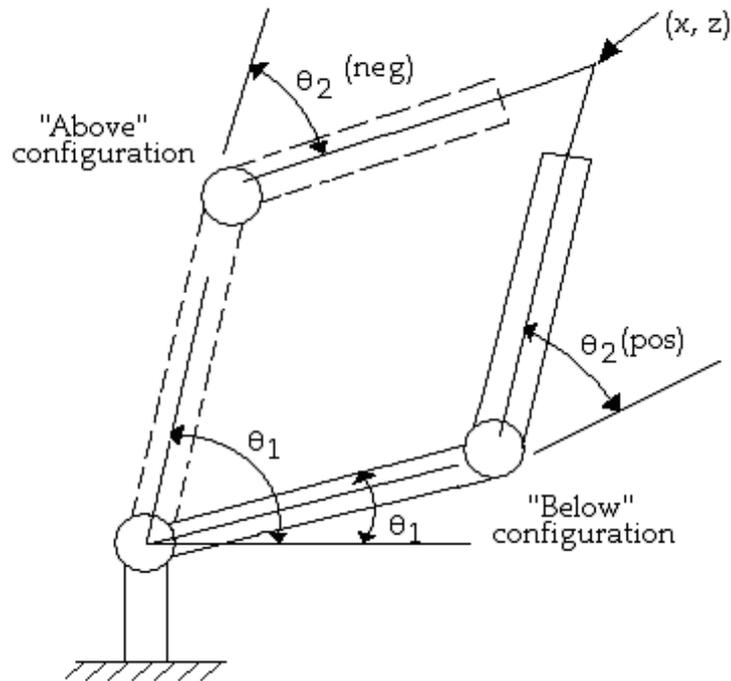


Figure 4

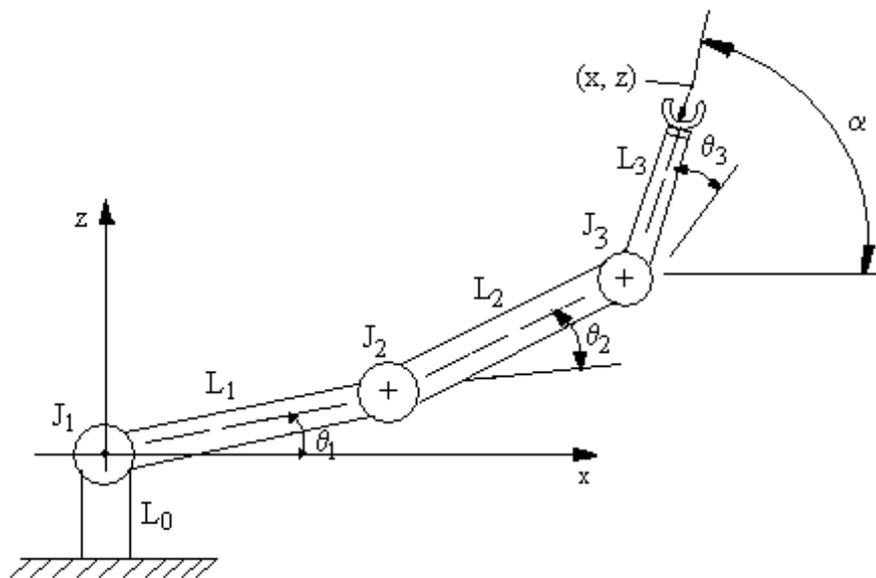


Figure 4

5. Using Norton - Euler forward equations, determine the joint torques or forces of a planar RP robotic Manipulator. [16]
6. (a) What are the features and capabilities of structured programming languages? Explain.
- (b) What are the two basic ingredients of task - object languages? Explain.

- (c) What are the problems to be solved before task - object languages? Explain. [8+4+4]
7. A dc tachometer is to be used as the velocity feedback device on a certain twisting joint. The joint actuator is capable of driving the joint at a maximum velocity of 0.75 rad/sec and the tachometer constant is 8 V/rad/sec.
- (a) What is the maximum output voltage that can be generated by the device, if the tachometer is geared with the joint so that it rotates with twice the angular velocity of the joint?
- (b) If the joint rotates at a speed of 25⁰/sec, determine the output voltage of dc tachometer. [8+8]
8. (a) What are the general considerations in robot material handling?
- (b) Discuss the robot application in pick - and - place operations. [8+8]

IV B.Tech I Semester Regular Examinations, November 2012
CELLULAR AND MOBILE COMMUNICATIONS
(Com to Electronics & Communication Engineering and Electronics &
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1. (a) Describe the performance criteria of a mobile communication systems.
(b) Discuss the propagation attenuation and severe fading in a mobile radio transmission medium. [8+8]
2. What are the considerations of the components of a cellular system, Explain in detail. [16]
3. (a) Explain how co-channel interference is measured in real time mobile radio transceivers.
(b) Explain different methods to reduce the cochannel interferences. [8+8]
4. (a) Prove that in two ray ground model $\Delta = d_1 - d_2 \cong 2h_t h_r / d$ and state the condition for above expression to present a good approximation.
(b) Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz, For a vehicle moving at 90kmph. Compute the received carrier frequency if the mobile is moving in a
 - i. Direction towards the transmitter.
 - ii. Direction away from the transmitter
 - iii. Direction, which is perpendicular to the direction of the arrival of the transmitting signal. [10+6]
5. (a) Draw the symmetrical sum pattern and compare it with symmetrical difference pattern.
(b) Draw the directional antenna configuration for 120° sector (45 channels) and explain how interference is reduced? [8+8]
6. (a) What is self location scheme? Why it is used in cellular system?
(b) Explain how a underlay-overlay cells are arranged in sectorized cells?
(c) Explain how the channels are assigned in a directional antenna cell system? [4+6+6]
7. (a) Why the handoffs are needed in cell sites?
(b) What are the advantages of delayed handoffs?
(c) What are the reasons for perception of dropped call rate by the subscribers can be higher? [6+6+4]

8. (a) Draw and explain the time organization of a TACH/F.
- (b) Explain why the numbering of the uplink slots is derived from the downlink slots by a delay of 3 time slots?
- (c) What is the compensation time for the propagation delay in sending to the mobile station via SACCH? [6+6+4]

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1. (a) What are the features of the mobile communication? Explain each of them.
(b) What are the differences between first and second generation systems? [8+8]
2. (a) Discuss in detail the Hand off mechanism.
(b) Compare interference from first tier of six interferers with that from twelve interferers of second tier. [8+8]
3. (a) Describe the effect of antenna parameters on cell interferences.
(b) Discuss the diversity schemes for interference reductions at both mobile unit & cell site. [8+8]
4. (a) Explain the general formula of received power from real model based on shadow case, direct path & over the water condition in detail.
(b) Briefly explain the effect of foliage loss in mobile signal propagation. [8+8]
5. (a) Write the equation of general pattern for a 2N elements array equi-spaced by a separation 'd'.
(b) Differentiate between Roof-mounted and glass-mounted antennas.
(c) What are the advantage of using umbrella pattern antennas at cell site? [4+6+6]
6. (a) Prove that the cell size decreases, the use of set up channels should increase.
(b) Compare the handoff blocking in spatially uniform and nonuniform traffic distribution for FCA, BCA and FBCA. [8+8]
7. (a) How to make a handoffs successful at the cell site?
(b) Explain how cell splitting is used to prevent dropped calls. [8+8]
8. (a) Why Analog cellular systems are limited to use FDMA only? What type of multiple access used in Digital cellular systems?
(b) Why constant time delay is required between uplink and down link?
(c) Explain how a time slot number is organized? [6+6+4]

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1. (a) What are the limitations of conventional mobile telephone systems? How are they overcome by cellular systems?
(b) Why Hexagonal-shaped cells are used in cellular system. [10+6]
2. Discuss in detail the consideration of components of cellular systems. [16]
3. (a) Explain the co-channel interference areas from mobile receivers based on test1.
(b) Explain about the nonlinear amplification in Noncochannel interference. [8+8]
4. (a) Explain about foliage loss in detail.
(b) Discuss the merits of point-to-point model. [8+8]
5. (a) Draw the symmetrical difference pattern and compare it with symmetrical sum pattern.
(b) Draw the cell site antenna for omni cells for 45 and 90 channels and explain them. [8+8]
6. (a) Differentiate between the Access channel and Paging channel.
(b) Explain how to avoid interference between two system while assigning setup channels?
(c) Why the cochannel interference is avoided easily in sectorization than in cell splitting? [6+4+6]
7. (a) What type of handoff is used when a call initiated in one cellular system and enter another system before terminating? Explain how it works.
(b) Explain how the coverage is increased for a noise-limited system by the parameters of the system. [8+8]
8. (a) What are the different types channels present in GSM? Explain them in detail and discuss their function in GSM.
(b) What type of modulation is used in TDMA Digital Cellular system? What are the advantages of it? [10+6]

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1. (a) Explain the digital cellular system with TACS.
(b) Compare and explain the advantages of cellular phones over conventional mobile phones. [8+8]

2. Discuss:
 - (a) Maximum no. of calls per hour per cell.
 - (b) Maximum no. of frequency channels per cell.
 - (c) Explain about blocking probability of Cellular system. [6+6+4]

3. (a) In a directional antenna system compare $k=4$ and $k=7$ for 60° and 120° sector case.
(b) What is SINAD meter? Explain. [12+4]

4. (a) Prove that in two ray ground model $\Delta=d_1-d_2 \cong 2h_t h_r/d$ and state the condition for above expression to present a good approximation.
(b) Consider a transmitter which radiates a sinusoidal carrier frequency of 1850 MHz, For a vehicle moving at 90kmph. Compute the received carrier frequency if the mobile is moving in a
 - i. Direction towards the transmitter.
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 - iii. Direction, which is perpendicular to the direction of the arrival of the transmitting signal. [10+6]

5. (a) Draw the symmetrical difference pattern and compare it with symmetrical sum pattern.
(b) Draw the cell site antenna for omni cells for 45 and 90 channels and explain them. [8+8]

6. (a) Explain how the frequency management increases spectrum efficiency?
(b) Draw a short term traffic relief scheme used for a seven-cell three face system and explain it. [8+8]

7. (a) Why the handoffs are needed in cell sites?
(b) What are the advantages of delayed handoffs?

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- (c) What are the reasons for perception of dropped call rate by the subscribers can be higher? [6+6+4]
8. (a) Draw the external environment of the BSS and explain its functioning in GSM.
(b) Explain the call process of Mobile Station in CDMA system. [8+8]



IV B.Tech I Semester Regular Examinations, November 2012
SOFTWARE PROJECT MANAGEMENT
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Technology)

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1. What is adversarial stakeholder relationship? Explain. [16]
2. State the chronology of events in performance assessment? [16]
3. Describe the various concerns of different stakeholders? [16]
4. What are the different activity levels across the lifecycle phase explain. [16]
5. (a) Develop “context-free-questions” that you might ask a stakeholder during inception. [16]
(b) Write default agendas for the life-cycle architecture milestone. [8+8]
6. (a) What are the typical components of the organizational infrastructure? [16]
(b) What are project environment artifacts? Explain. [6+6+4]
(c) What are the four important environment disciplines? [6+6+4]
7. (a) What are the advantages of measurement? [16]
(b) Discuss about process discriminants. [6+10]
8. Discuss about Ada COCOMO. [16]

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1. Describe the basic parameters that can be used for the abstraction of the software cost models? [16]
2. Explain in detail the five basic parameters of the software cost model? [16]
3. Describe the various concerns of different stakeholders? [16]
4. Summarize the importance of software architecture and its close linkage with modern software development process. [16]
5. (a) Give an outline of step wise planning activities.
(b) What are the activities covered by software project management. [8+8]
6. Write default project organization and responsibilities. Explain. [16]
7. (a) Write the process discriminators that reuse from differences in architectural risk.
(b) Give an example of SPCP and explain. [8+8]
8. Discuss about next-generation cost models. [16]

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1. Describe the various objectives used for the measurement of software size? [16]
2. Describe the various dimensions of scheduling? How dimensions are helpful in improving software economics? [16]
3. Validate the separation of the implementation set from the deployment set with an example? [16]
4. Compare and contrast a model and a view with appropriate example. [16]
5. (a) Briefly explain the purpose of each of the sections in a software project plan.
(b) What is the critical distinction between a milestone and deliverability?
(c) Write about pragmatic planning. [8+4+4]
6. (a) On a large project it is often be the responsibility of a team leader to allocate tasks to individuals. Why might it be unsatisfactory to leave such allocations entirely to the discretion of the team leader?
(b) Discuss about processes and project management. [8+8]
7. (a) What is an indirect measure? Why such measures are common in software metrics work?
(b) Present an argument against lines of code as measure for software productivity. Will your case hold up when dozens or hundreds of projects are considered? [8+8]
8. (a) Discuss about the progress profile of a modern project.
(b) Explain risk management of CCPDS-R. [8+8]

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1. What is the impact of the Documentation and review meetings? [16]
2. Discuss the general quality improvements with a modern process? [16]
3. Describe the two stages of the life cycle to active economies of scale and higher returns on investment. [16]
4. Explain in detail the four phases (Inception, Elaboration, construction and transition). [16]
5. (a) Define stakeholder. Who are stakeholders? Explain.
(b) Discuss about periodic status assessments. [8+8]
6. Explain in detail about the configuration management process. [16]
7. Team A found 342 errors during the software engineering process prior to release. Team B found 184 errors. What additional measures would have to be made for projects A and B to determine which of the teams eliminated more efficiently? What metrics would you propose to help in making the determination? What historical data might be useful? [16]
8. (a) What is the purpose of the concept definition and full scale development in the project CCPDS-R.
(b) How was the project organization in CCPDS-R project? [8+8]
