**SYLLABUS for LDCE in S&T Dept.**

**PROFESSIONAL SUBJECT – PART-I.**

Maximum Marks – 100 Time – 3 Hours

**NOTE**: Total six questions to be answered – Three in Part-'A' and Three in Part-'B' Four questions to be set in each part and three out of four to be answered.

**'A'**

General and Subsidiary Rules as applied to Railway operations, signalling and works connected with signalling and P.Way; Special reference as applied to automatic signalling and APB(Auto Perm. Block) working; Rules for opening of a Railway with special reference to standards of interlocking at wayside stations, provision of signals at level crossing gates and outlying sidings; rules for working of outlying sidings with & without token control on single line; catch and slip sidings. Signal Engineering Manual with special reference to various requirements of block working, provision of signalling and interlocking; inspections to be carried out by officers and subordinates etc. Telecommunication Engineering Manual with reference to various types of line wire circuits and wireless circuits. Departmentally owned Telecommunication alignments; various parameters valid for Copper, ACSR and G.I. wires and their limitations; improvement to communication circuits by patching with other carrier circuits, procedures for indenting of stores for revenue and works, imprest stores, Stock sheets and other matters connected with goods store keeping practices; Block Working Manual, with regard to requirements of token and token less instruments on single line and double line instruments. Schedule of dimensions and operating manual with special reference to infringements. Operations as affecting or guided by better Signalling and Telecommunication arrangements.

**'B'**

Fundamental Engineering and applied technology; simple machinery like inclined plane, pulley blocks, travelling trollies, machines which aid in reduction of time and labour in installation of various signalling gears; Principle of magnetism and electricity as affecting the operation of signalling equipments like Relays – both AC and DC, Point Machines, Signal Reversers, Signal Machines etc. Fundamental electronics with special reference to power supply and stabilisation of power supply equipments. Simple digital circuits as required for digital clocks, Axle Counters etc. Heat engines and standby Diesel Generators with manual starting, electric starter and automatic starter. A.C. to D.C. converters, D.C. to A.C. invertors and D.C. to D.C. converters as power supply sources in Signalling and Telecommunication. Special measures required for Telecommunication power supply to reduce noise. Power supply distribution for signalling schemes with reference to voltage drop, size of cables etc.

## PROFESSIONAL SUBJECT – PART-II.

Maximum Marks – 100 Time – 3 Hours

**NOTE**:Total 6 questions to be answered. Four questions to be provided in each of the three parts 'A', 'B' & 'C'. Three questions to be answered from any one part and three from any of the other two parts.

### 'A'

(i) Mechanical Signalling with special reference to provision of rod and wire compensators, double wire operation of points; detectors and signals. Temperature compensation in both Orthodox and double wire Signalling. Various aspects of lever frames and methods of looking achieved.

(ii) Basic principles of electrical interlocking with reference to track locking, back locking, approach locking, sectional route release and sequential locking.

(iii) Track Circuits both DC and AC; Axle Counters as substitute for Track Circuits.

(iv) Interlocking plans, locking tables and selection circuits.

(v) Types of Point Machines with their special features including operating, control and detection circuits. Block Circuits for Token, Tokenless and Double Line Instruments, Direction Lever Working with Track Circuits and Axle Counters for single line sections, APB Signalling and intermediate block signalling.

(vi) Automatic Signalling, Detailed Circuit operation for AC and DC Traction areas including cascading circuits.

(vii) Simple Panel Interlocking, using metal to carbon Relays and metal to metal Relays.

(viii) Route Relay Interlocking, Electronics Track Circuits, Automatic Warning System, Centralised Traffic Control.]

(ix) Special features of Signalling in AC Traction Areas.

### 'B'

Overhead line wire, underground cable system. Special armatures of circuits in 25 KV traction areas. 2 wire to wire circuits. Conversion of 4 wire to 2 wire and 2 wire to 4 wire circuits. Control office and wayside station equipment of different types, emergency control communication equipments. Telephone Exchanges of PAX, PBX, MAX-II and MAX-I types. Trunk Exchanges of various types. Telegraphy-Horse, teleprinter circuits. Derivation of Telegraphic Channels through S+DX and VFT. Multiplexing equipments, derivation of channels by frequency translation using sub-groups, basic groups and super groups. HF-SSB Communication; multi-channel communication using VHF, UHF, Microwave Systems using Audio Relay methods, signal to noise ratio and fading.

### 'C'

(i) Workshop practice – Raw materials, processing, workshop machines and their utilisation. Quality control. Overhauling procedures and practices – Inspection, stage and final and testing.

(ii) Prime Movers.

(iii) Manufacture of Axle Counters – details – components – testing procedure – commissioning and measurements.

(iv) Repairs and testing of HF Transmitter, microwave trans-receiver, ultra sonic flaw detectors, automatic warning system.

(v) Overhauling of Relays – requirement – procedure – methodology etc.

## NOTES ON ACCOUNTS FOR LDCE(S&T)

Compiled by: RPS YADAV, SSE/Tele/RE/Allahabad

## SYLLABUS

1. Parliamentary control over railway finance
2. Public accountability
3. Financial priority
4. Financial planning & Budgeting
5. Budgetary financial review
6. Appropriation accounts
7. Rules of allocation
8. Classification of expenditure control over expenditure.
9. Responsibility accounting
10. Performance Budgetary
11. Exchequer control
12. Financial resulting of working
13. Works program
14. Financial justification of works
15. Survey
16. Preparation of estimates
17. Capital budget
18. Control over capital expenditure
19. Productivity test
20. Financial control over stores expenditure
21. Purchase & stores keeping procedure
22. Inventory control & ABC analysis
23. Financial & cost control in railway workshops
24. Rules & procedure relating to tenders & contracts for execution of works & procurement of stores
25. Procedure for processing & finalizing the audit objections & draft Para
26. Delegation of powers
27. Losses frauds & embezzlements

**Notes of Establishment Rule for LDCE ( S&T )**

Compiled by -- RPS Yadav,
SSE/Tele/RE/Allahabad

**Syllabus**

1. Organization of Personnel Dept in railways
2. Objective of Personnel dept
3. Functions & policies of personnel dept.
4. Role of personnel officers in HQ & Divn.
5. Classification of services Group A to D
6. Recruitment of artisan staff
7. Special reservations in railway services
8. Role of RRB in recruitment
9. Recruitment through other channels
10. Promotion policies & methods
11. Personnel supervision
12. Formal& informal democratic or participative leadership style
13. Advantage of participation
14. Joint council management
15. Negotiation schemes
16. Zonal & corporate enterprise groups
17. Inspectors of loco sheds, C&W Dipo, Stns & Engg offices
18. Imp recognized trade unions in railways
19. Role of unrecognized unions and methods of dealing with them
20. Industrial disputes and Legislative framework
21. Causes of industrial dispute and basic remedies
22. Industrial dispute act 1947
23. Strikes & lock outs
24. Ways of handling grievances by LEOs
25. HOER & overtime
26. Job analysis & its machines
27. Factory acts
28. Special rules for workshop staffs
29. Workmen compensation act
30. Ex-gratia payment
31. Incentive bonus scheme
32. Pass rules
33. Retirement benefits under provident fund scheme
34. Final settlement
35. Welfare for the family of retired and concept & practice of obtaining

QUESTION BANK

SIGNAL

Q1: With the help of a sketch, define station limits for “B” class stations equipped with Two Aspect signalling on single line and double line sections.

Q2: What are the classifications of stations in Indian Railways?

Q3: What do you mean by “Read Back Technique” in Railway signalling? Please cite few examples of this technique being used in your Railway.

Q4: What is the difference between “A” Marker and “A” Board in Railway signalling?

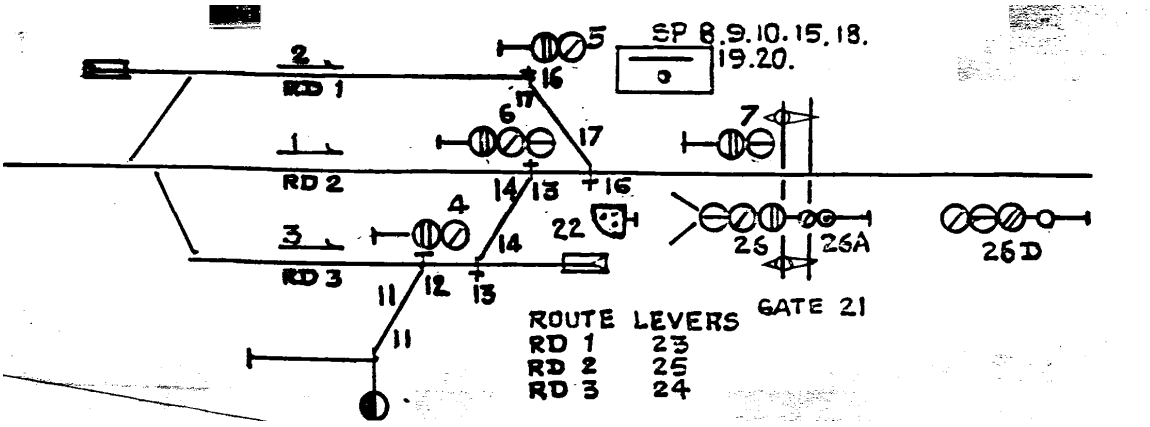
Q6: What do you mean by the “S” Marker and where it is being used in Railway signalling?

Q5: What is the normal aspect of a signal in Automatic signalling territory?

Q6: What do you mean by Slip siding and Catch siding? Write down cases when Slip siding and Catch siding are required to be provided in the Railway system.

Q7: In Indian Railways, what are the systems of train working adopted? Please also mention the name of the most widely used system on Indian Railways.

Q8: Please prepare the locking table for Lever numbers 1, 3, 4, 6 & 7 of the following diagram: -




Q9: What are the essential requirements of the Absolute Block System?

Q10: What are the standards of interlocking prescribed in Railway Signalling?

Q11: What are the different classes of LC gates? Please explain.

Q12: What do you mean by the term “Route Holding” in Railway signalling? Please explain the various means to achieve the same.

Q13: What do you mean by “Loose” and “Tight” locking in Railway signalling? Please explain with examples.

Q14: What do you mean by Ballast Resistance? What are the minimum permissible values for the ballast resistance in the station yard and in the Block section?

Q15; What do you mean by the staggering of adjacent track circuit rail polarities and why is this required?

Q16: List the names of various types of traction bonds used in RE area using DC track circuits.

Q17:Write down the adjustment of DC track circuit for failsafe and reliable working.

Q18: What do you mean by Fouling Protection of Track? Please explain.

Q19: What is Dead Section in track circuit area and how can it be eliminated?

Q20: What do you mean by cut section track circuit and/or fed over track circuits?

Q21: Can an AFTC be used in a track section with steel sleepers? Why?

Q22: What do you mean by “End Fed” and “Centre Fed” types of AFTCs along-with corresponding maximum permissible lengths of track circuits?

Q23: What are the various types of Bonds being used in AFTCs?

Q24: Please list the names of the constituent parts of a Electrical Lever Lock and its functioning.

Q25:: What do you mean by Indication Locking and Track Locking and on which levers these are being used?

Q26: Explain the working of Snubbing Circuit in Point machine operation using 3-wire control.

Q27: What is the concept of Cross protection in signalling circuits? Please explain.

Q28: Explain the working of 4-wire point detection circuit using circuit diagram.

Q29: What do you mean by super imposed detection of points? As per the latest directives of Railway Board, is it suggested to use this arrangement?

Q30: Write down the general features of IRS Rotary Type point machines with 143 mm stroke.

Q31: Explain the working of Point operation circuit using Siemens Point Contactor unit in an electromechanical installation.

Q32: What do you mean by RHS and LHS turnouts? Can we use the same type of Point machine (IRS Rotary type) for both the turnouts? Please explain.

Q33: Compare different types of conventional signal lamps.

Q34:: What are the different types of ECRs being used with conventional signal lamps?

Q35: What are Triple Pole lamps? Describe their merits over Double pole lamps.

Q36: What do you mean by H-Type, I-Type and L-Type signal transformers along-with their uses?

Q37: What is Aspect Control and Aspect Control circuits? Draw an aspect control circuit for an inner distant signal in Double Distant signalling territory.

Q38: What is cascading of signal aspects? Explain with suitable circuit diagram.

Q39: What do you mean by Red Lamp Protection? Expalin with suitable diagrams.

Q40: What do you mean by Cutting in Arrangement in signalling circuits and reason for its use?

Q41: What do you mean by “Direct Feeding”, “Local Feeding” and “Remote Feeding” of signals? Explain.

Q42: Describe the advantages of LED signal Lamps over conventional signal lamps.

Q43: What are the various PVC signal cables used in Railway signalling in SECR? Are they screened one or not?

Q44: What do you mean by cable meggering? Please explain.

Q45: What is Electric Signal Reverser? List different types of Electric Signal Reversers being used over Indian Railways.

Q46: What do you mean by EKT? Describe the working of EKT.

Q47: What do you mean by TS, TSS, FP, SP & SSP? Please explain.

Q48: What are the effects of RE in signalling?

Q49: List the names of various types of Block Instruments being used in stations on Single/Double line and RE/Non-RE area. What special feature is incorporated in the block instruments meant for use in RE area?

Q50: What do you mean by maximum length of parallelism in Railway Signalling over RE area? Explain.

Q51: Why the repeater relays of track Relays are made Slow To Pick-up and with what time delay and why? Explain.

Q52: What are the reasons behind using various traction bonds in Track Circuits over RE area?

Q53: What arrangements/changes are required to be carried out in the DC track circuits being used in RE area w.r.t. Non-RE area?

Q54: What are the effects of RE in signalling circuits and how are they minimised?

Q55: List the various types of Route indicators used in Railway Signalling and which type is being commonly used in Indian Railways?

Q56: What are the items which are being used to increase the length of a DC track circuit in RE area? What are the maximum permissible length of track circuits in Single and Double line section on RE area?

Q57: What are the maximum permissible distances for direct feeding of signals on Single and Double line section in RE area?

Q58: What are the various means of suppressing the value of induced voltages at the source of 25 kV traction? Explain.

Q59: Draw a sketch showing the arrangement of power supply, neutral section feeding post, sectioning & sub sectioning posts.

Q60: Draw and explain the State Transition diagram for the working of Axle Counter.

Q61: What are the different constituent parts of an axle counter?

Q62: What is Trolley Suppression Track circuit? Why is it necessary in Axle counter?

Q63: What are approach locking, back locking and dead approach locking in electrical signalling? Explain with suitable examples using sketches.

Q64: What do you mean by Sectional route release in electrical signalling? Explain with suitable example using sketches.

Q65: What is Crank Handle Interlocking in Railway signalling? Explain with suitable example using sketch.

Q66: What is LC Gate Interlocking in Railway signalling? Explain with suitable examples using sketches.

Q67: What is the working principle of 24V battery charger used in Railway signalling? Explain with sketch.

Q68: What do you mean by Filters in electrical rectifier circuits? What is the difference between the chargers being used in signalling and telecommunication applications?

Q69: What is IPS? Describe in detail. How many battery banks are used in IPS in Railway signalling?

Q70: What is electrical transformer? Explain its working in detail.

Q71: Mention the major advantages of the SMPS over Thyristor controlled Power supplies.

Q72: What is an Inverter and where is this being used in Railway Signalling?

Q73: Calculate the total load in a typical 4 line way side station with one siding line and a common loop in a Double line section. Draw necessary sketches.

Q74: In a PI installation, which circuit ensures the “One Signal-One Train” feature? Please mentioned the name of this circuit and explain with suitable example.

Q75: Explain the signal control circuit for a home signal with one route with suitable sketch and circuits.

Q76: List the name of activities pertaining to signal department which require prior sanction of CRS for their execution in the yards.

Q77: What is the validity period of CRS sanction? Explain the process for obtaining CRS’s sanction.

Q78: What do you mean by ground connections?
Q79: What is the role of Drawing Office in S&T department?

Q80 What are the equipments to be provided with a Trolley/Lorry/Motor Trolley?

Q81 What is IB signal? Why this signal is provided? Is it being provided on single line section? Explain the working of an IB signal.

Q82 What is the procedure to pass an IBS signal at its ON aspect by the driver of any train?

Q83: What is half notch? Why is this provided and in which equipment/instrument?

Q84 Draw the Block Clearance circuit for SGE Double line instrument using appropriate circuits.

Q85 What are the principles of Lock and Block working? How these are achieved in SGE Double Line Block Instrument?

Q86 In Siemens signal group relays, the GLSR relay is made slow to release. Why? Please explain.

Q87 What are the items to be checked during scrutiny of Engineering Scale Plan?

Q88 What items will you check during inspection of a motor operated point?

Q89 What items will you check during inspection of SSDAC?

Q90 What item are being noted during day/night footplate?

Q91 What items are being noted during joint point and crossing inspection with SE/SSE (P-Way)?

Q92 Draw the ALSR CKT for signal number S- ?

Q93 How will you councell your staff to prevent short cut method?

Q94 Why Disconnection Memo should be issued before attending to maintenance of certain signal gears & for which activities/works, it should it be issued?

Q95 (a) What is the propose of using the choke in single rail DC track circuits in RE area?

Q95 (b) What is half notch? Why is this provided and in which equipment/instrument?

Q96 Draw the complete diagram of Single Rail DC track circuit in RE area including value of cack component?

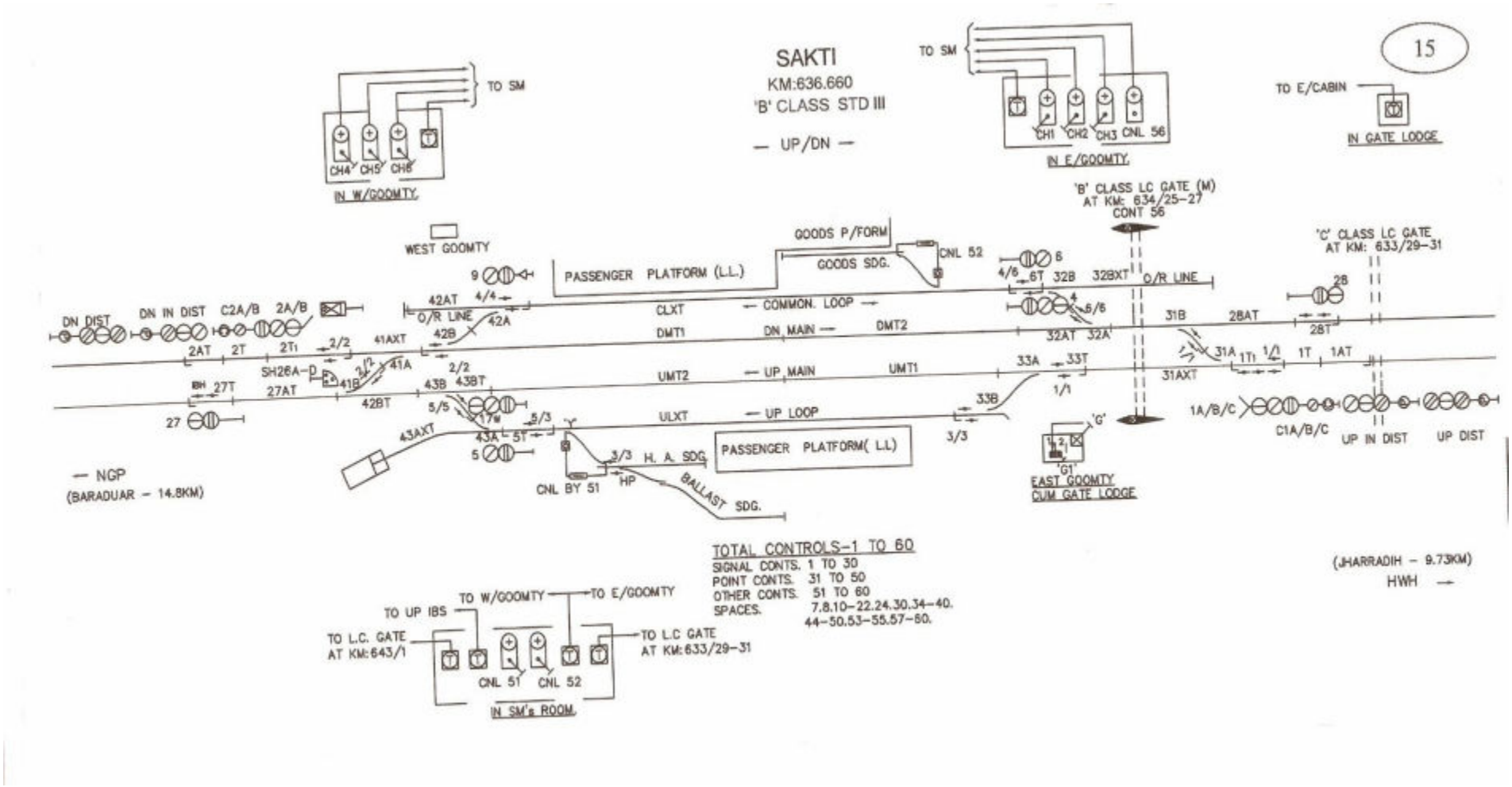
Q97 What parameters are being checked during inspection of Analog Axle Counter and what are their standard values?

Q98 (a) What are the conditions for granting line clear in double line B class station on MACLS territory?

Q98 (b) What are the conditions for granting line clear in single line B class station on Two Aspect CLS territory?

99. Draw the dog chart of following: - 2 X 3 W 5 R

100. For the given yard draw the RCC for the following signals: -
– Down Home Signal (S-1), Shunt Signal (Sh- 26), Starter Signal (S-4) and Calling On signal (Co-2).


SAKTI
KM:636.660
'B' CLASS STD III
— UP/DN —
15
TO SM
CH4 CH5 CH6
IN W/GOOMTY
TO SM
CH1 CH2 CH3 CNL 56
IN E/GOOMTY
TO E/CABIN
IN GATE LODGE
'B' CLASS LC GATE (M)
AT KM: 634/25-27
CONT 56
'C' CLASS LC GATE
AT KM: 633/29-31
WEST GOOMTY
GOODS P/FORM
GOODS SDG.
CNL 52
PASSENGER PLATFORM (L.L.)
DN DIST
DN IN DIST
C2A/B
2A/B
2AT
2T
2T1
42AT
O/R LINE
42B
42A
CLXT
— COMMON. LOOP —
DMT1
DN. MAIN —
DMT2
O/R LINE
32B
32BXT
28
28AT
28T
31B
32AT
32A
41AXT
SH26A-D
41B
41A
43B
43BT
42BT
UMT2
— UP MAIN
UMT1
33A
33T
31A
31AXT
1T1
1T
1AT
27T
27AT
27
43AXT
43A
5T
ULXT
— UP LOOP
33B
3/3
H. A. SDG.
PASSENGER PLATFORM( LL)
CNL BY 51
HP
BALLAST SDG.
'G'
'G1'
EAST GOOMTY
CUM GATE LODGE
1A/B/C
C1A/B/C
UP IN DIST
UP DIST
— NGP
(BARADUAR — 14.8KM)
(JHARRADIH — 9.73KM)
HWH —
TOTAL CONTROLS-1 TO 60
SIGNAL CONTS. 1 TO 30
POINT CONTS. 31 TO 50
OTHER CONTS. 51 TO 60
SPACES. 7.8.10-22.24.30.34-40.
44-50.53-55.57-60.
TO W/GOOMTY
TO E/GOOMTY
TO UP IBS
TO L.C. GATE
AT KM:643/1
TO L.C GATE
AT KM:633/29-31
CNL 51
CNL 52
IN SM's ROOM.

## QUESTION BANK
## TELECOM

1. What is Radio Patch? Describe it with the help of a Suitable diagram to patch control circuit, in case of need.
2. Explain phase lock loop system with suitable diagram.
3. How rainfall attenuation is measured in MW communication.
4. What are the advantages of digital MW communication in comparison with the analog MW?
5. Write one method of finding the modulation index.
6. Discuss different methods for avoiding the fading in MW communication.
7. Discuss the salient features of DTL-MUX equipment.
8. Draw a block diagram of Transreceiver radio equipment of Digital radio MW.
9. What is the testing carried out before taking over the charge of digital MW system?
10. Draw the block diagram for Radio Equipment?
    7D6 & 7D15
11. Explain the function of 7D6 & 7D15 Radio Equipment?
12. What is fading? What are the counter measures Railways adopt to present?
13. What is DTL MUX? Explain it with diagram?
14. What is the meaning of video in & video-out signal-in Radio equipment?
15. How many types of measuring instrument are used in MW circuit? Write short notes on each?
16. Write the short notes to explain the following?
    - Channel Modem Card.
    - VFT card.
    - Design & set up the MW Communication in between two MW station and two telephone exchanges in Railways?

## CONTROL

1. Draw a neat sketch of a six pin socket wiring practiced in RE area and indicates the advantage in it.
2. Explain in detail DTMF Signaling and its advantages?
3. Why two tones are transmitted at a time in DTMF signaling? What are it's advantages?
4. What are the types of traffic train control being used in Railways? Explain each of them?
5. What is total interruption of control? What is the work procedure at stations in such situations?

## RE **&** 6 Quad CABLE

1. What is meant by Loading in RE Cable?
2. What is meant by BON? Why and where it is used in RE Cable?
3. What is meant by Half Loading Section?
4. What is meant by Screening Factor in an underground telecommunications cable?
5. Write down types of Telecom Cable used in Railway for different communication system.
6. Discuss benefits of replacement of O/H alignment by 6Q cable.
7. Write jointing procedure of 50 pair PIJF cable.

EXCHANGE

1. What is meant by Pulse Code modulation?
2. Give the working principle of Digital Exchange & its features.
3. Describe the properties of earthing used in Telecom with specific values used for resistances, wire diameter, in each case.
4. Explain the working of SPC Exchange in brief with block diagram.
5. Describe PCM-TDM with appropriate diagram where it is used.
6. What are the functions of Line cards?
7. Explain Call processing in Electronic Exchange.
8. Write different types of tones with frequency and 'ON' and 'OFF' time duration for each case.
9. What is "hunt group"? Explain the requirement of hunt groups.
10. What is DID and DOD. Explain advantages of these.
11. Write down the maintenance & protection of electronics exchange? How it is better than strongers?
12. Advantage of Digital Exchange over analog Exchange?
13. Write 10 of features of electronic exchange. Which you would like to have in your exchange?
14. Draw the basic structure of ISDN Exchange? What are the advantages & procedure's of it's working.
15. Explain the structure of 2mbps bit stream with frame & multiframe?
16. Explain Bit-interleaving and Byte-interleaving?
17. Write down procedure to augmentation of electronic exchange up to 5000 Lines along with justification. Prepare the brief estimate also.
18. How we can add two exchanges with 2MB connectivity? What will be its advantages.
19. Discuss and explain difference between IP exchange and SPC exchange.
20. Discussed feature of ISDN with block diagram?

OFC

1. Explain the function of an OLTE in Optic-Fiber-System?

2. What are the advantages of Optic fiber cable over the conventional cable system?
3. How STM is more useful in SDH system over PDH system.
4. How monomode fiber is advantageous for communication network rather than multichrome.
5. How dispersion is reduced in graded index fiber.
6. Discuss the merits & demerits of SDH?
7. What may be the reasons of alarm in OFC communication system?
8. Discuss the difference between PDH & SDH system? Also advantages of SDH over PDH system.
9. Explain different network Topologies & basic, requirement of topologies?
10. Write down in what ways transmission & reception occurs in OFC. How OFC can be optimum utilized in Indian Railways. How we can expand uses of OFC in Commercial ways.
11. What are test conducted in OFC?
12. How we can patch from OFC to conventional cable?
13. What is RDSO specification of OFC Cable.
14. Detail the works of Railtel? How this body is advantageous for Railways.

RAILNET

1. What is LAN? What is the difference between internet & intranet, and which can be categorized under LAN?
2. What do you meaning of LAN, WAN, MAN & VLAN?
3. What is the function of Router?
4. How networking in our Railway has been done? Discuss its benefits & procedures for Internet Connectivity.
5. Discuss different network topologies? Give explanation diagram for each?
6. How to connect 10 nodes (PC) in network. Explain with diagrams, detailing equipments needed.
7. Explain different network Topologies. Also explain requirement of individual topologies with diagrams?
8. What is Router? What types of ports are available in Router?
9. Explain the functions of switch? Also detail the advantages of switch over HUB?
10. What is VPN? How it will be useful in a corporate network?
11. What is Layer 3 switch?
12. What is synchronous & asynchronous communication?
13. What is the use of NMS to monitor and control the problems in Railnet?
14. Detail the differences between OSI & ISO layer?
15. Differentiate between L-3 switch and Router?
16. Difference between Hub and switch with diagrams?
17. What do you mean by NMS?
18. What is the permissible length between switch to switch via CAT-5/6 cable?

19. What is TCP/IP and UDP?
20. Why OFC cable is used in LAN? What are it's advantages?
21. Give details of AFRES, MMIS, and PRIME?
22. Why VLAN used? What are the advantages of VLAN configuration over the normal configuration?
23. Give full form of SNMP. Detail its basics and why it is used?
24. What is the meaning of MAC ?
25. What is IP address? Also give details of four sections of it.
26. Explain OSI seven layer model?
27. What is synchronous and asynchronous communication?
28. What type of mail server is being used in our Railway?
29. What are the minimum number of ports in a Router?
30. What theory used in LAN, is it Multicast, Unicast or Broadcast?
31. What is RAS and what are it's functions??
32. What is proxy server? Why Proxy server is being used in SEC Railway?
33. What do you mean by MPLS? Where it is used?
34. For testing one Hop distance which command are used?
35. How many types of modem are used for network? Specify for permanent & dialup types?
36. What do you mean about Firewall?
37. Why NetBIOS protocols are used?
38. In Railway which type of architecture are used for MIS?
39. List the differences between ROM & RAM?
40. What Operating and application software are used in client and server side in Railways for MIS application?
41. What do you mean by UTP CAT5/6 cables?
42. What is Hop distance?
43. For route checking which command are used in command mode?
44. What do you mean about IDS, IPS in security?
45. Which technology used for wireless data communication between two PCs. or Mobile to PC?
46. Bandwidth for STM-1 & E-2 steam?
47. MAC address is which Layer address in OSI Layer?
48. What are the terms indicated by subnet mask ?
49. Give an example of IP address, subnet mask and gateway of router with simple example?
50. Draw a block diagram of SECR Railnet with all network devices and servers and explain each network devices in brief. (Including R & NGP)
51. Give short notes on:
    - VOIP
    - URL
    - NIC
    - CSMA/CD
    - Frame
    - Packet

FOIS

1. How do we connect FOIS network between two stations. Explain with block diagram.
2. What are the advantages we are getting from FOIS? Explain fourth point of public & Railways.
3. Explain with block diagram the connectivity of FOIS between Divisions to HQ in SECR.

PASSENGER AMENETIES

1. Discuss how Touch & Feel system works in Railway. What are items included in it?
2. Discuss unification of PRS & UTS. What are the advantages of it?
3. Discuss how IVRS, video conferencing, Call Centre, Train Charting/Voice Recorder works.
4. Draw a block diagram of PRS at a way side station?
5. Write down the working principle of Coach Guidance System and Train indication board?

Interaction with other public agencies

Give short notes on:

(i) SACFA
(ii) PTCC
(iii) WPC

Write short notes: -

a. Wave Guide
b. Space Diversity
c. Fade Margins
d. Frequency Diversity
e. Railnet
f. FOIS
g. OTDR
h. NTES
i. IVRS
j. DTMF Signaling
k. ISDN
l. LAN
m. WAN

n. FOIS
o. MODEM
p. LAN Extender
q. Router
r. Voice Data Logger
s. NMS
t. PRC
u. CCB Telephone
v. Q signaling
w. Jitter & Wander
x. PDH
y. SDH
z. Leased line
aa. BRI
bb. PRI
cc. TDM
dd. PCM
ee. CUG scheme

## Objective type questions- Telecom

(i) Write full forms of the following

i. CEPT card
ii. ISDN
iii. SMPS
iv. MTBF
v. OTDR
vi. SCADA
vii. ACSR
viii. OLTE
ix. MODEM
x. NMS
xi. UTS
xii. PIJP
xiii. DTMF
xiv. BON
xv. GSM
xvi. CRIS
xvii. FOIS
xviii. SPC
xix. DTMS
xx. COIS

xxi. AMI
xxii. HDB-3
xxiii. TDM
xxiv. RMS
xxv. STM
xxvi. LAN
xxvii. WAN
xxviii. PCM
xxix. GRIM
xxx. CUG
xxxi. TDM
xxxii. NMS

(ii) Write True/False of the following:-

1. In OFC Cable Repeater, Index of Core is kept higher than clad. (For Total Internal Reflection) (T/F)
2. OTDR can be used to measure the Splice loss also in OFC-(T/F)
3. Inmarset works via satellite and any access to Private Network is not required- (T/F)
4. In (PRS+UTS) unified system UTS counter can issue a Reserved Ticket- (T/F).
5. For Radio Patching working of CNL cuts. It is necessary to convert 4W.CKT into 2W before patching.- (T/F).
6. With MLLN of CNL cuts, it is necessary to convert 4W CKT into 2W before patching- (T/F).
7. In DTMF dialing always two different frequencies are transmitted (T/F).
8. 1 Watt is equal to 30 dbm. (T/F)
9. 672 MB are provided in STM-I (T/F)
10. OTDR is used in Digital MW. (T/F).
11. WAN can be provided in closed premises. (T/F).
12. In TDM, the transmission of signal is on time sharing basis. (T/F)
13. In SPC Exchange, the switching network set up temporary connection between two are more exchanges. (T/F)
14. LAN Extender can be used for WAN connectivity (T/F).
15. Specification of OFC Cable is IRSTC-55(T/F).

(iii) Fill in the blanks.

1. The duration of a multiframe is ……..
2. In a 30 channel system, the sampling time period is…….
3. In 30 cahnnel PCM system, a time slot duration is ……. microsecond.
4. STM 4 is having ----------2Mb
5. In data circuit, Data transfer limit in CAT-6 cable is ---------

6. Channel transmission capacity of STM-1 is ----------
7. Bit rate of 2Mb with ---------- PPM tolerance.
8. Bit rate of 2nd order mux ---------- Kbps ---------- PPM tolerance.
9. Duration of frame ----------
10. Duration of Time slot ----------
11. What does EPABX stand for ----------
12. Analog Subscriber loop resistance ---------- Ohm.
13. Working voltage of electronic exchange ---------- V ---------- tolerance.
14. Ideal working Temperature of exchange ----------
15. Dial tone ---------- Hz modulated with ---------- Hz frequency.
16. Ring back tone ---------- Hz modulated with ---------- Hz frequency.
17. Busy tone ---------- Hz modulated with ---------- Hz frequency.
18. Switch is a ---------- device (Broadcasting/Unicasting).
19. Switch function on the principle of ---------- (CSMA/CDMA).
20. Insertion loss of Telephone equipment in the case of: -
    - Handset is on the -----/switch/Nil
    - Handset is off the -----/switch/0.2db
    - Press to -------"button pressed/3.0db

Objective/True-False and short Questions
SIGNAL

1 Operating Current of coil of indicator in DLBI is about:-
   i) 40 – 50 mA ii) 95-100mA
   iii) 17-25 mA iv) 37-42 mA

2 Rated current and coil resistance of a polarized relay is:-
   i) 100 mA & 100 Ohm ii) 33 mA & 25 Ohm
   iii) 25 mA & 77 Ohm iv) 125 mA & 77 Ohm

3 L-Type of transformers are used:-
- i) Where Signals lamps are directly fed up to 605 Mtr.
- ii) Where LED Signals lamps are used.
- iii) Where Signals lamps are directly fed up to 240 Mtr
- iv) Where Signals lamps are directly fed beyond 1000 Mtr

4 Rating of SL-35B triple pole lamps is :-
- i) 12 V/24W,24W
- ii) 12V/24W,18W
- iii) 24 V/24W,24W
- iv) 24V/12W,12W

5 The No. of front and back contacts in QTA2 relay is:-
- i) 1F/1B
- ii) 2F/1B
- iii) 1F/2B
- iv) 2F/2B

6 Minimum permissible TSR with concrete sleeper track circuits in RE area is:-
- i) 2.5Ω/KM
- ii) 0.6 Ω /KM
- iii) 0.25Ω/KM
- iv) 0.5 Ω /K

7 QS3 DC neutral Relays are used in :-
- i) All circuits of non RE section
- ii) Only internal circuits of RE area
- iii) In axle counter in place of self type relay
- iv) Point machine controlling RE area

8 QJ1 DC neutral Relays are used in :-
- i) All circuits of non RE section
- ii) For timing control
- iii) In axle counter in place of self type relay
- iv) Point machine controlling RE area

9 Lamp proving relays are :-
- i) Current sensing DC line relays
- ii) Voltage sensing DC line relays
- iii) Current sensing DC track relays
- iv) Voltage sensing DC track relays

10 Rated Voltage and Power of an AC LED signal is :-
- i) 230V, 15W
- ii) 110V, 50W
- iii) 110 V, 15W
- iv) 230V, 50W

11 In DLBI Commutator handle gets locked when it is turned :-
- i) From Line Close to Line Clear
- ii) From Line Clear to Line Closed
- iii) From Line Closed to train on Line

iv) Line Clear to Train on Line

12 ALSR Relay is used for :-
i) Sequential route release ii) Sectional Route release
iii) Route Locking iv) Dead approach locking

13 EUYNR is: -
i) Emergency route cancellation relay
ii) Emergency group signal cancellation Relay
iii) Emergency route cancellation button relay
iv) 120 second time delay relay

14 Commissioner of Railway Safety (CRS) belongs to the ministry of:-
i) Railways ii) Civil Aviation
iii) Surface Transportation iv) Labour

15 Refresher course of signal supervisors is required once in:-
i) 3 Year s ii) 5 Years
iii) 4 Years iv) 6 Years

16 Number of aspects in the Inner Distant signal of an IBS signal in Double Distant signalling territory is:-
i) 3 ii) 2
iii) 4 iv) Same as those of its Distant Signal

17 Longitudinal bonding is provided by:
i) Engineering Department
ii) Electrical department
iii) S&T department
iv) Combined with ii &iii

18 Induced voltage in unscreened cable for double line is
i) 116 V/Km
ii) 95 V/Km
iii) 87.5 V/Km.
iv) 78.5V/Km

19 Maximum length of direct feeding for screened and unscreened cables respectively is
i) 890 m and 980 m
ii) 345m and 543m
iii) 600m and 240m
iv) 640m and 200m

20 IRS type high thrust point machine can operate safely with maximum contact test load of…..kg on the throw bar
i) 670
ii) 700
iii) 730
iv) 760

21 Stroke of IRS type point machine is
i) 143 mm
ii) 220 mm
iii) Both i and ii
iv) Stroke can be adjusted between 110 mm to 220 mm

22 No. of throw rod, detection rod and lock rod in IRS type point machine are
i) 1, 2 and 2
ii) 2,1 and 2
iii) 2, 2 and 1
iv) 2,2 and 2

23 Study the following statement about testing of Glued Joints
A) In dry condition resistance of glued joint shall be less than 25 Mega ohm when meggering voltage of 100 V DC is applied across the joint
B) In wet condition resistance of glued joint shall not be less than3 Kilo ohm when meggering voltage of 100 V DC is applied across the joint.

Which of these statements are true?
i) Both A & B
ii) Only A
iii) Only B
iv) None of A & B

24 Study the following statement
A) For track Circuits lengths up to 700 m, Maximum permissible rail resistance is 2 Ohm/Km
B) For track Circuits lengths more 700 m, Maximum permissible rail resistance is 0.5 Ohm/Km.
Which of these statements are true

i) Both A & B
ii) Only A
iii) Only B
iv) None of A & B

25 Study the following
A) Rail resistance = (Voltage Drop in Rails)/ Average track circuit current
B) Ballast Resistance = (Average rail Voltage)/Leakage Current

Which of these statements are correct?

i) Both A & B
ii) Only A
iii) Only B
iv) None of A & B

26 Study the following statement
A) For safe working of track Circuits, without a shunt across the track, track relay excitation shall not exceed 250% of its pick up valve.
B) With normal feed source voltage and minimum permissible ballast resistance of the track, Track relay voltage shall be less than 125 % of its pick up valve.
Which of these statements are true?
i) Both A & B
ii) Only A
iii) Only B
iv) None of A & B

27 Study the following statement
A) In DLBI block bell has separate line wire.
B) In DLBI Top indicator needle of station in advance is connected to bottom indicator needle of station sending train.
i) Both A & B are correct
ii) Only A is correct
iii) Only B is correct
iv) None of A & B are incorrect

28 Study the following statement
A) In DLBI, Commutator handle should locked first before the “Train on line” indication appears on the indication when the handle is turned from “Line Clear” to “Train on line” position.
B) If turning of Commutator is done quickly, a situation may arise when TOL contacts are made but the Commutator is not locked in TOL position.
i) Both A & B are correct and B is correct explanation of A.
ii) Both A & B are correct and B is not correct explanation of A
iii) Only A is correct.
iv) Only B is correct.

29 Study the following statement
A) A transverse Rail Bond is provided connecting all the non-insulated rails.
B) This provides continuous return path to traction current.

i) Both A & B are correct and B is correct explanation of A.
ii) Both A & B are correct and B is not correct explanation of A

iii) Only A is correct.
iv) Only B is correct.

30 Study the following statement
Transverse Bond is provided by …… department and identification of non-insulated rail is done by…….department.
i) S&T, Electrical
ii) S&T, S&T
iii) Electrical, S&T
iv) Electrical, Electrical

31 Study the following statement
A) In double cutting arrangement, proving of control contacts is done on either limb of HR coil.
B) This prevents false energisation of HR from multiple faults.
i) Both A & B are correct and B is correct explanation of A.
ii) Both A & B are correct and B is not correct explanation of A
iii) Only A is correct.
iv) Only B is correct.

32 EI & PI are provided for stations having no. of routes….. and …… respectively.
i) 0-25, 25-200
ii) 70-100, 20-35
iii) 50-200, 0-50
iv) 5-100, 100-200

33 Track crossings of signalling cables are done at a depth of 1meter below …….
i) Ballast Level
ii) Top Level of Rail
iii) Bottom Level of Sleeper
iv) Bottom Level of Rail

34. M/s CEL is one of the manufacturers for:
a. Analog Axle Counters only
b. Integrated Power Supply
c. Electronic Interlocking Equipment
d. Both Analog and Digital Axle Counters

35. For Mechanical Signal Items, who does the inspection of materials?
a. RDSO
b. RITES
c. Consignee
d. None of the above.

36. The “Outlying Siding” is referred to the siding for which:

a. The siding line takes off from running lines and the siding is located out side of that station.
b. The siding line takes off from running lines and is located in side of that station.
c. The siding line takes off from running lines and located between block stations.
d. An additional line is provided for this purpose in any station.

37. CRS's sanction is not required for the following work in the existing yard?
    a. Replacing mechanical operation of a point with motor operation
    b. Inserting a turnout on passenger running line
    c. Shifting of a signal from LHS to RHS.
    d. Opening of a new line for public

38. The following is wrong with respect to track repeater relay (TPR)?
    a. It has 12 Front /4 Back contacts
    b. It is of QNA1 type
    c. It has got AC immunity against induced voltages
    d. It is an example of track relay

39. The power supply Track Circuits are taken through which of the following components/modules of the IPS?
    a. Rectifier
    b. DC-DC converter
    c. Inverter
    d. Transformer

40. Choose the correct option for Digital Axle Counters presently being used in SEC Railway
    a. It has both "Preparatory" and "Hard" Resetting options
    b. It doesn't require trolley suppression track circuit
    c. It can detect more than one section
    d. It uses only Two conductors for establishing communication between the pair of EJBs

41. Block Bell Equipment is used for
    a. Converting AC line voltage coming from the Block instrument at other end of station to required DC voltage in local Block instrument
    b. Converting high AC line voltage coming from the Block instrument at other end of station to a required low AC voltage in local Block instrument

    c. Converting high DC line voltage coming from the Block instrument at other end of station to a required low DC voltage in local Block instrument

d. Converting DC line voltage coming from the Block instrument at other end of station to required AC voltage in local Block instrument

42. What is the approximate maximum distance for Direct Feeding of conventional signal lamps on Double Line RE area?
    a. 180 meters
    b. 600 meters
    c. 595 meters
    d. 220 meters
43. Choose the correct answer from the following
    a. The term “Block Forward” is concerned with the station lying only in a Single Line section
    b. The term “Block Back” is concerned with the station lying only in a Single Line section
    c. The term “Block Back” is concerned with the station lying either in a Single Line section or a Double Line section
    d. The term “Block Back” is concerned with the station lying only in a Double Line section

44. The signal overlap for IBS signal is
    a. 120 meters
    b. 180 meters
    c. 200 meters
    d. 400 meters

45. The Outer and Warner signals in LQ signalling territory are examples of
    a. A permissive and stop signals respectively
    b. A stop and permissive signals respectively
    c. A subsidiary and main signals respectively
    d. Both are subsidiary signals

46. What is the normal aspect of main signals in Automatic Signalling territory?
    a. Yellow
    b. Red
    c. Green
    d. Double Yellow
47. As per the latest policy of Railway Board, Level Crossing Gate can be interlocked if the TVU of the LC gate is
    a. Up to 20,000
    b. Below 25,000
    c. Between 15,000 to 20,000
    d. More than 25,000

48. Which is correct with respect to VCOR in signalling installations?
    a. This is a special type of relay used in Digital Axle Counter

b. This is a special type of relay used to control rectifier output of an IPS
c. This is a special type of relay used in Electronic Interlocking
d. This is a special type of relay used in Siemens RRI

49. The working of an electrical transformer is based on
a. Mutual Inductance
b. Self Inductance
c. Hall Effect
d. Self Conductance

50 Circuit wiring in PI installations over SECR is being done with
a. 0.6 mm tinned wire
b. 1.0 mm tinned wire
c. 16/0.2 multi strand copper wire
d. 1.5 Sq. mm copper wire

51 Fill in the blanks:-

i) For Roding, running under the track the minimum distance between top of Roding and bottom of rail should be….
ii) Minimum length of the lock bar for a broad gauge is……..
iii) Lock bar should have minimum no. of Clips…….
iv) The colour of point lever is ……..
v) Resumption of normal working after overhauling can be done by SSE / Signal if no. of lever are not more than ……..
vi) All gates within station limit are called …gates.
vii) A gate qualifies for interlocking if the TVU are more than……..
viii) Clearance between road surface and LC boom should be between ……to…… Meter.
ix) Far boom locking to be effective it shall not be possible to lift the boom by …..From close position.
x) Minimum of. …….. % of spare conductors are to be provided in the main cable up to farthest point zone.
xi) Station section in a “C’ class station is from ……to ……
xii) Specification of self regulatory battery charger is S……
xiii) A concrete sleeper is used in track circuited area if it has a minimum resistance of ….Ohms between insert to insert.
xiv) Minimum cross section of lead wire for track circuit should be …….mm.
xv) Excitation level of a track relay will not be less than …….of rated pick up voltage.
xvi) Plug in type of track relays has to replace after …….years.
xvii) The overhauling period of DLBI is …….years.
xviii) For obstruction test of a point test piece is kept at a ……distance from the tow of

xix) Fuse of correct capacity should be of about ……time the rated current in signaling circuit.
xx) The minimum implantation distance of a colour light signal from the centre of the track should be ……..
xxi) The colour of shunt signal button on the panel is ……..
xxii) Route setting on the panel is indicated by…….
xxiii) UYR relay is used for …….
xxiv) WCR relay is used for…….
xxv) ALSR is used for …….
xxvi) The value of induced voltage in unscreened cable in double line section is ……..ohm/Km.
xxvii) The AC immunity of a IRS point machine is…….Ohm.
xxviii) As per SEM the minimum visibility of a distance signal in MACLS territory is……..
xxix) The Block Section Limit Board is located at minimum …..metre from home signal.
xxx) Clamp type direct locks are desirable for speed above……Km/Hour.

52. Write full form of :-

(i) SPAD
(ii) CCRS
(iii) RAMS
(iv) ECTS
(v) CTC
(vi) SSDAC
(vii) MSDAC
(viii) EKT
(ix) REB
(x) TLJB
(xi) MACLS
(xii) OLWR
(xiii) DMTR
(xiv) MTTR
(xv) MTBF

52. Write true or false:-

i) Insulated rail shall be kept clear of the ballast by 25mm.
ii) Only single rail track circuit can be provided in 25 KV Ac area.
iii) Rail joint bonds are maintained by S&T department.
iv) Audio frequency track circuit does not require glued joints.
v) Diodo token less block instrument cannot be used in RE area.
vi) 3-Phase point machine is immune to induced voltage and can be used to any length of parallelism.
vii) Direct feeding of AC LED signals is permitted up to 2 Kms.

viii) All external circuit requires cross protection arrangement.
ix) When SM key is out no operation can be done from the panel.
x) Calling- on signal button is of red colour with white dot.
xi) Implantation distance is painted in red colour on signal post if distance is more than 2.36 metre.
xii) Shelf type line relays are overhauled on after every 15 year.
xiii) CRS approval is required for locating a signal on right side.
xiv) For solid rodding the minimum unsupported length is 1.8 metres.
xv) Green notice is issued by traffic department.
xvi) The type of turn out is specified in Interlocking plan.
xvii) Calling- on signal detects all the points in routes and overlap.
xviii) After two months of commissioniong responsibility of maintaining Signalling gears in station lies on open line even if station is not handed over to open line.
xix) Interlocking of a L. C. gates requires sanction of CRS.
xx) QSPA1 relay is used as repeater of TR.
xxi) Authority to proceed means authority to enter in block section.
xxii) Station limit and station section means same thing.
xxiii) Class “D” stations are non interlocked.
xxiv) Double yellow aspect means caution.
xxv) A depended shunt signal has no ON aspect.
xxvi) In automatic signaling letter “A” in white on black circular disc is provided.
xxvii) Absolute block system is most prevalent system of block working.
xxviii) Driver can pass an Automatic signal in red without any authority.
xxix) Caution board is provided at 400 metre away from speed indicator board.
xxx) Grease/petroleum jelly can be provided on secondary battery terminals to prevent corrosion.
xxxi) The LED ECR used in ON aspect can also be used for route aspect.
xxxii) SL-21 signal lamps have two filaments of equal rating.
xxxiii) The maximum length of track circuit in RE area using PSC sleeper is 350 metres.
xxxiv) Force drop arrangement is provided in EKT.
xxxv) Calling –on signal is of lunar white colour.