SIR C.R. REDDY COLLEGE OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC YEAR: 2018-19, II-SEMESTER

I-INTERNAL EXAMINATIONS

Subject with Code: **Transportation Engineering-I** CE-3205 Dt: 29-01-2019.

Class: III/IV B.E-Civil Max. Marks: 30 Time: 2:00 to 3:40 PM

Answer the following

1. a) Explain the term CRF. (2M)
   b) What are the various surveys to be carried out before planning a highway system for a given area? Explain briefly. (4M)

   (OR)

   c) How are roads classified as per Nagpur road plan? (2M)
   d) Explain the various factors controlling alignment of a highway? (4M)

2. a) Enumerate PCU. (2M)
   b) Explain origin and destination study? What are the various uses of O&D studies? (4M)

   (OR)

   c) What are the causes and preventive measures of road accidents? (6M)

3. a) What is total reaction time? What are its two component parts? (3M)
   b) Design the super elevation required at a horizontal curve of radius 300m for speed of 60kmph.assume suitable data. (3M)

   (OR)

   c) What is overtaking sight distance? Derive the equation with analysis of overtaking sight distance. (6M)

4. a) What is design hourly volume? How is it obtained? (2M)
   b) List the various traffic control devices and explain in detail any two of them. (4M)

   (OR)

   c) What are speed and delay studies? How is it conducted in the field? (6M)

5. a) Write a short note on (6M)
   i) Rotary island ii) Desire lines iii) Running speed and Spot speed

   (OR)

   b) Write short note on (6M)
   i) IRC ii) Jayakar committee

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SIR CR REDDY COLLEGE OF ENGINEERING

DEPARTMENT OF CIVIL ENGG

2018-19 - II-SEM

I INTERNAL EXAM

TRANSPORTATION ENGG-I CE3205

1) a) Explain the term CRF.

Based on the authority of a resolution adopted by the Indian legislature, the central Road fund (CRF) was formed on 1st March 1929. At that period the consumers of petrol were charged an extra levy of 2.4 paisa per litre of petrol to build up the Road development fund. Central Road fund Act 2000 was notified in december 2000 which gave Statutory Status to the existing central Road fund governed by a resolution of the parliament in 1988

b) What are the various Surveys to be carried out before planning a highway System for a given area? Explain briefly.

A) Before a highway alignment is finalised in a new highway project, Engineering Surveys are to be carried out. These Egineering Surveys may be completed in the following four stages,

a) Map Study
b) Reconnaissance Study
c) preliminary Surveys
d) final location and detailed Surveys

a) Map Study:

If the topographic map of the areas available it is possible to suggest the likely routes of the road. In India, topographic maps are available from the Survey of India with 15 & 30 metre contour intervals

The probable Alignment can be located on the map from the following details available on the map.

a) Alignment avoiding valleys, ponds & lakes
b) Approximate location of bridge site for crossing rivers, avoiding bend of the river if any

Reconnaissance:

During the reconnaissance the Engineer visits the site and Examines the general characteristics of the area before deciding the most feasible routes for detailed study. Some of the details to be collected during reconnaissance are given below.

1) Valleys ponds, lakes, marshy land, ridge, hills, permanent structures and other obstructions along the route which are not available in the map.
2) Sources of construction material, water and location of stone quarries

Preliminary Survey:

1) to survey the various alternates proposed after the reconnaissance and to collect all the necessary physical information and details of topography

The procedure of the conventional methods of preliminary survey is given in following steps:

1) primary traverse
2) topographical features
3) levelling work
4) Soil Survey
5) material Survey
6) traffic studies

Final location and detailed survey:

The Alignment finalised at the design office after the preliminary survey is to be first located on the field by establishing the centre line. Next detailed survey should be carried out for collecting the information necessary for the preparation plan and construction details for the highway project

c) How are roads classified as per Nagpur Road plan?

A) The Nagpur road plan classified the roads in India based on location and function into following five categories and described below.

1) National Highways
2) State Highways
3) Major district Roads
4) other district Roads
5) village Roads

d) Explain the various factor controlling alignment of a Highway?

A) The various factor which control the highway alignment in general

a) delivery points
b) traffic
c) Geometric design
d) Economics
e) other considerations

delivery points

There are control points governing the alignment of the highways. These control points may be divided broadly into two categories

1) points through which the alignment is to pass
2) points through which the alignment should not pass

traffic

The road alignment should be decided based on the requirements of road traffic. O & D study should be carried out in the area and the desire lines be drawn showing the trend of traffic flow.

Geometric design

The details of the geometric design such as gradient, radius of curve and sight distance also would govern the final alignment of the highway.

Economics

The alignment finalised based on the above factors should also be economical. i) Initial construction cost of the road, ii) regular and periodic maintance cost of the road and iii) vehicle operation cost in future years.

Other Considerations

Various other factors which may govern either the horizontal & vertical alignment of the road are drainage considerations, hydrological factors, political considerations and monotony.

2) a) Enumerate PCU

A) Different class of vehicles such as car, van, bus, trucks, auto rickshaw, motor cycle, pedal cycle, bullock cart etc, it is a common practice to consider the passenger car as the standard vehicle unit to convert the other vehicle class and this unit is called 'PCU'

b) Explain origin and destination study? what are the various use of O&D studies?

A) Origin and destination studies (O&D) give information on the actual location & zone of origin of travel of vehicles or individual passenger trips and their destination. The studies provide details such as direction of travel, selection of routes, trip length and the frequency and no of such trips.

Applicatns

Various applicatn of O&D studies may be summed up as follows

a) to judge the adequacy of existg routes and to plan new network of roads

b) to establish design standards for the road, bridge and culverts along the route

c) to locate Expressways or major routes along the desire lines

d) to locate new bridge as per traffic demands

c) what are the causes and preventive measures of road accidents?

A) There are five basic elements in a traffic accident

a) Road user
b) vehicle
c) Road and its condition
d) traffic
e) Environmental factors such as weather visibility etc,

(B) Various Caus of accidents may be listed as given below

a) drivers: Excessive speed and rash driving, carelessness, violatn of rule and regulatns, failure to see or understand the traffic situatn, sign or signal temporary effects due to fatigue, sleep or effect of consumg alcohol

b) pedestrains violatn regulatns, carelessness while using the carriageway meant for vehicular traffic

c) passengers slightg from a gettg into movg vehicles

d) Vehicle defects: failure of brakes, steerg system, tyre burst,

e) Road condition: slippery or skidding road surface

f) Road design: Defective geometric design like inadequate sight distance at horizontal or vertical curves

g) Traffic condition: other vehicle of the traffic stream. Such vehicles may ahead getting involved.

h) Weather: unfavourable weather conditions like mist, fog snow dust smoke & heavy rainfall which restrict normal visibility and render driving unsafe.

Measures for the reduction in accident rate:

The various measures to decrease the accident rates may be divided into three groups:

1) Engineering
2) Enforcement
3) Education.

Engineering measures:

a) Road design - The geometric design features of the road such as sight distance, width of pavement, width of shoulders, horizontal and vertical alignment design details and intersection design elements are checked and corrected necessary.

b) preventive maintenance of vehicle, braking system, steering

c) Before and After studies: collision and condition diagram.

d) Road lighting: Proper Road lighting can decrease the rate of accident.

Enforcement measures:

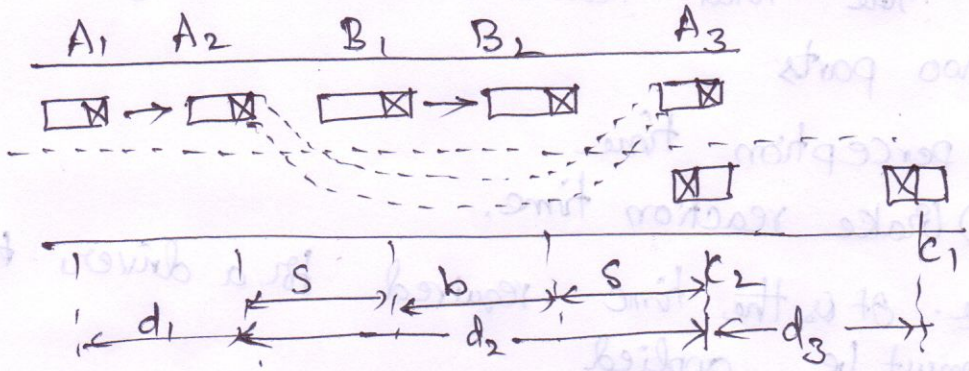
a) Speed control
b) Traffic control device
c) Traffic and Super vision
d) Medical check
e) Special precautions for commercial veh
f) observance of law and regulation.

Educational measures

a) Education of Road users
b) Safety drive

c) what is overtaking sight distance? Derive the Equation with Analysis of overtaking sight distance? (7)

A) the minimum distance open to the vision of the driver of a vehicle intending to overtake slow vehicle ahead with safety against the traffic of ~~operation~~ opposite direction is known as the 'minimum overtaking sight distance'.



a) From position A_1 to A_2 the distance $d_1 = V_b t$

t = ~~total~~ reaction time = 2 sec as per IRC

V_b → reduced speed

$$\boxed{d_1 = 2V_b}$$

b) From position A_2 the vehicle overtaken by accelerating shifting to the adjoining lane overtakes the vehicle B and position A_3

$$\boxed{d_2 = S + b + S}$$

S = spacing of vehicle = $0.7V_b + 6$

$b = V_b T$

$d_2 = (b + 2S) = \left[V_b T + \frac{aT^2}{2}\right]$ $\quad 2S = \frac{aT^2}{2}$

$T = \sqrt{\frac{us}{a}}$ $\quad S = 0.7V_b + 6$

$d_2 = (V_b T + 2S)$

c) from position C_1 to C_2

$d_3 = VT$

OSD = $d_1 + d_2 + d_3$

$$\boxed{OSD = 2V_b + V_b T + 2S + VT}$$

3) a) what is total reaction time? what are the two component parts?

A) Reaction time of the driver is the time taken from the instant the object is visible to the driver to the instant the brakes are effectively applied. The total reaction time t' may be split up into two parts

1) perception time
2) brake reaction time.

perception time. It is the time required for a driver to realise that brakes must be applied

brake reaction time. It is the time taken by the driver for the final action such as brake application.

b) Design the super elevation required at a horizontal curve of radius 300m for speed of 60kmph. Assume suitable data.

A) R = 300m

V = 60Kmph

$$e = \frac{V^2}{254R}$$

$$= \frac{60^2}{254 \times 300}$$

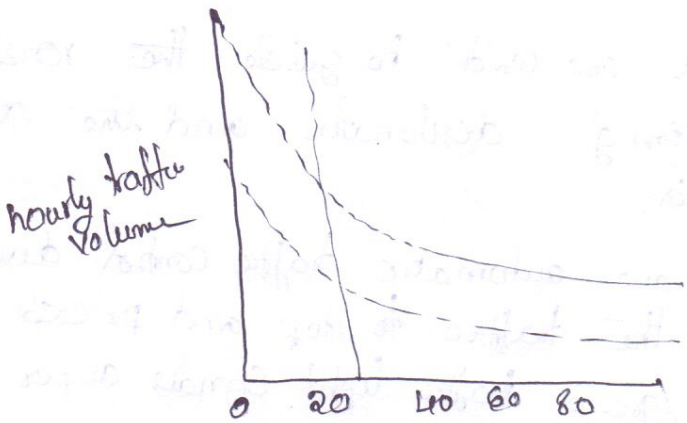
$e = 0.047 < 0.07$

~~$e < 0.047$~~

Provide super elevation 0.04

4 a) what is design hourly volume? How is it obtained? (9)

A) The design hourly volume obtained from the plot between hourly volume and the no of hours in an year as shown in figure



The highest a peak hourly volume of the year will be too high that it will not be economical to design the facilities according to this value.

The data collected during the traffic volume studies are processed and are presented in the form of AADT, ADT and design hourly volume.

b) List the various traffic control devices and explain in detail any two of them?

A) a) Traffic Signs
b) Traffic Signals
c) Road markings
d) Traffic Islands

Traffic Signs: The traffic signs have been divided into three categories with the objective regulating, warning and guiding the users of motor vehicles as per the motor vehicle Act of India.

1) Regulatory Signs
2) Warning Signs
3) Informatory Signs

Regulatory Signs: These Signs are meant to inform the road user of certain Laws, regulations and prohibitions.

Warning Signs: warning Signs are used to warn the road user of certain hazardous Conditions that Exist on or adjacent to the roadway.

Information Signs: These Signs are used to guide the road users along the routes, inform them of destinations and the distance, thus provide with information.

b) Traffic Signals: Traffic Signals are automatic traffic control devices which would alternately direct the traffic to stop and proceed at intersections using red and green traffic light signals as per the pre-determined time settings.

Types of traffic Signals

1) Traffic control Signals
2) pedestrian Signals
3) Special traffic Signals.

c) what are Speed and delay Studies? How is it Conducted in the field?

d) The Speed and delay studies are carried out to Calculate the running Speeds of vehicle, overall speeds of vehicle, variation in Speeds of different vehicles and also to obtain the time b/w two sections of a road placed at a certain distance part. These studies are also employed to determine amount, position, duration, frequency and cause of delay the moving traffic. The use of Speed and delay studies.

1) To find out the Exact location of the point of Congestion
2) To Calculate the rate of travel
3) To Carry out the benefit cost Analysis
4) To determine the roadway Efficiency

The various methods used for carrying out the speed delay studies are

a) Floating Car method
b) license plate method
c) Interview method
d) Elevated reading method
e) photographic method.

a) Floating Car methods: In the Floating Car method' a test vehicle is driven over a given route of travel at approximately the average speed of the stream, thus trying to float with the traffic stream.

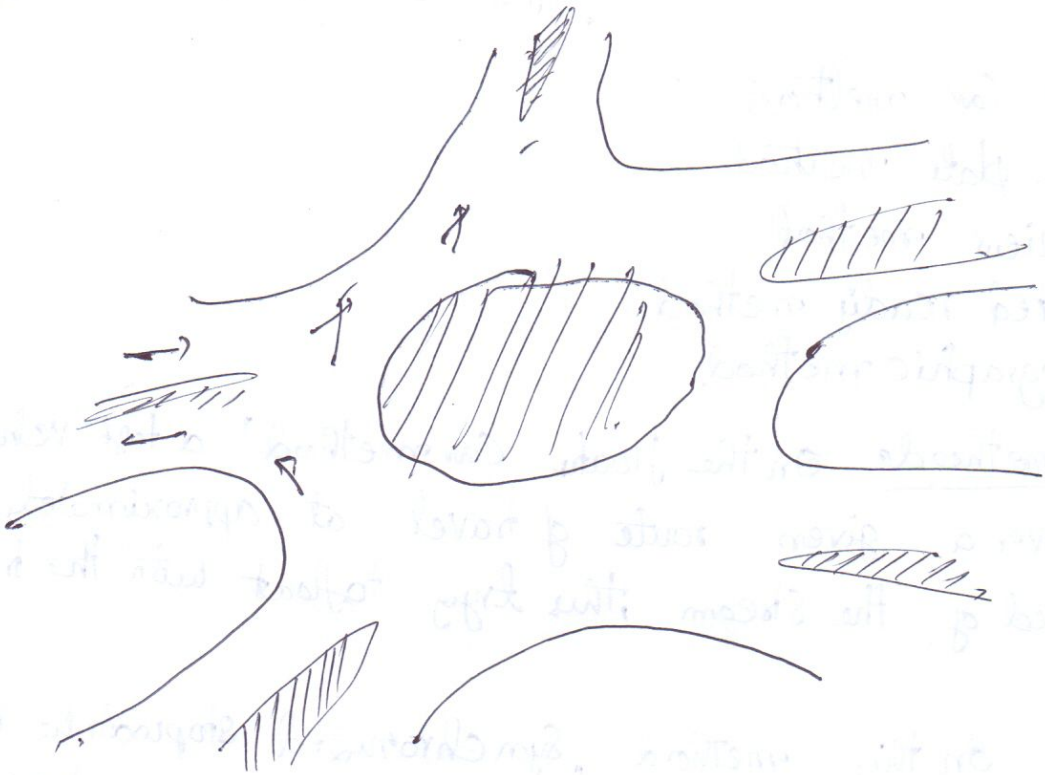
b) license plate: In this method, synchronized stopwatches or voice recording Equipment are used observers are stationed at the Entrance and Exit of the test strech when information of travel time is required.

c) Interview technique: In the interview technique the work can be completed in a short time by interview and collection the required details from the vocal user on the spot.

d) Elevated observation and photographic technique:
Observers with timer are located at an elevated observation point from where the movement of most of the vehicles within the desired strech or intersection area could be observed

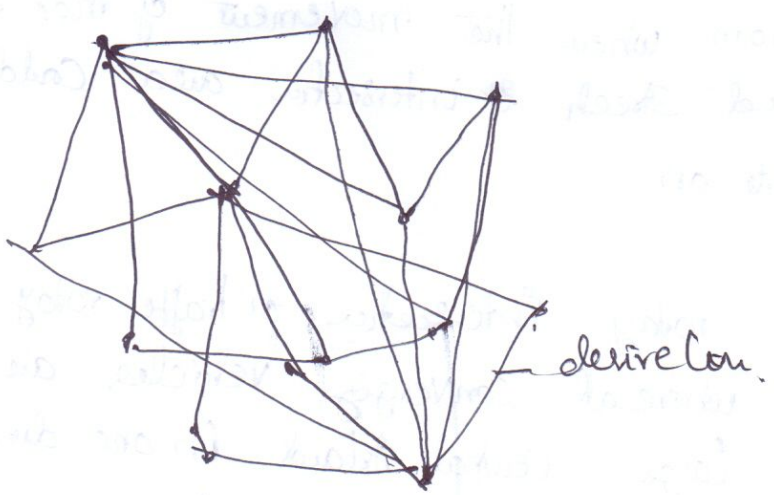
5) a) write short note on

1) Rotary Island:
A rotary intersection or traffic rotary is an enlarged road intersection where all converging vehicles are forced to move round a large central island in one direction before they can leave out of traffic flow into their respective direction radiation from the central island



ii) desire lines

Desire lines are draw after the preparati of table. Desire lines are the straight lines which connect the points of OSD of vehicle and are presented into different area groups. The width of the desire lines is kept proportional to the number of trips made by a vehicle it moves in both directions.



iii) Running Speed and Spot Speed

Running Speed: It is the average speed maintained by a vehicle over a particular stretch of road, Running Speed is obtained by divide the distance covered or the length of the stretch by by the running time or the time during which the vehicle is actualy in motion.

Spot Speed: It is the instantaneous Speed of a vehicle at a specified c/s or location.

5) write a short note on

1) IRC:

From the recommendations of Jayakar committee, a semi official technical body was formed in 1934 is known as Indian Road Congress. The IRC is especially formed for the following.

1) to provide meetings for regular pooling experience, views and ideas on all matters, which effects the planning and maintenance of roads.

2) to recommend for Standard Specification for roads development.

2) Jayakar committee:

In 1927 a resolution was passed by the both the Chambers of India. Therefore India Road development committee was appointed by the Central government with Mr Jayakar as chairman.

1) Road development must be considered as a national interest because, it was uncontrolled and out of range from capability of provincial governments

2) A 'CRF' must be collected from the road user in terms of Extra tax on petrol.