



Subject : Mechanics of Structure

Time : 3 Hours

Course: Polytechnic-Civil

Full Marks : 70

Pass Marks: 28

- Candidates are required to give their answers in their own words as far as practicable.
- Question Paper is divided into **Three Parts –A, B & C**
- **Part-A** is compulsory.
- **Part- B** contains **SIX** questions out of which **FOUR** questions are to be answered.
- **Part- C** contains **SIX** questions out of which **THREE** questions are to be answered.

PART A

Q.1) All questions are compulsory

A] Multiple Choice Questions :

(10x2=20)

- The total change in length of a bar of different is equal to the
 - Sum of changes in the lengths of different sections
 - Average of changes in the lengths of different sections
 - Difference of changes in the length of different sections
 - None of these
- A circular bar of the length (l) uniformly tapers from diameter(d_1) at one end to diameter(d_2) at the other. If the bar is subjected to an axial tensile load (P), then its elongation is equal to
 - P/AE
 - Pl/AI
 - $4Pl/4\pi E d_1d_2$
 - $Pl/4\pi E d_1d_2$
- The maximum stress produced in a bar of tapering section is at
 - Larger end
 - Smaller end
 - Middle
 - Anywhere
- When a rectangular section of a beam is subjected to a shearing force, the ratio of maximum Shear stress to the average shear stress is
 - 2.0
 - 1.75
 - 1.5
 - 1.25
- In a triangular section, the maximum shear stress occurs at
 - Apex of the triangle
 - Mid of the height
 - 1/3 of the height
 - Base of the triangle

- vi) A square with side x of a beam is subjected to a shearing force of F . The value of shear stress at the top edge of the section is
- Zero
 - $0.5Fl a^2$
 - $Fl a^2$
 - $1.5 Fl a^2$
- vii) Torque transmitted by a solid shaft of diameter (D), when subjected to a shear stress (τ) is equal to
- $\frac{\pi}{16} \tau x D^2$
 - $\frac{\pi}{16} \tau x D^3$
 - $\frac{\pi}{32} \tau x D^2$
 - $\frac{\pi}{32} \tau x D^3$
- viii) Polar moment of inertia of a solid shaft of diameter (D) is
- $\frac{\pi}{16} x D^3$
 - $\frac{\pi}{16} x D^4$
 - $\frac{\pi}{32} x D^3$
 - $\frac{\pi}{32} x D^4$
- ix) Theorem of perpendicular axis is used in obtaining the moment of inertia of a
- Triangular lamina
 - Square lamina
 - Circular lamina
 - Semicircular lamina
- x) If the area of a section is in mm^2 and the distance of the center of area from a line is in mm , then units of the moment of inertia of the section about the line is expressed in
- mm^2
 - mm^3
 - mm^4
 - mm^5

PART B

Q2. Answer any four:

(4x5=20)

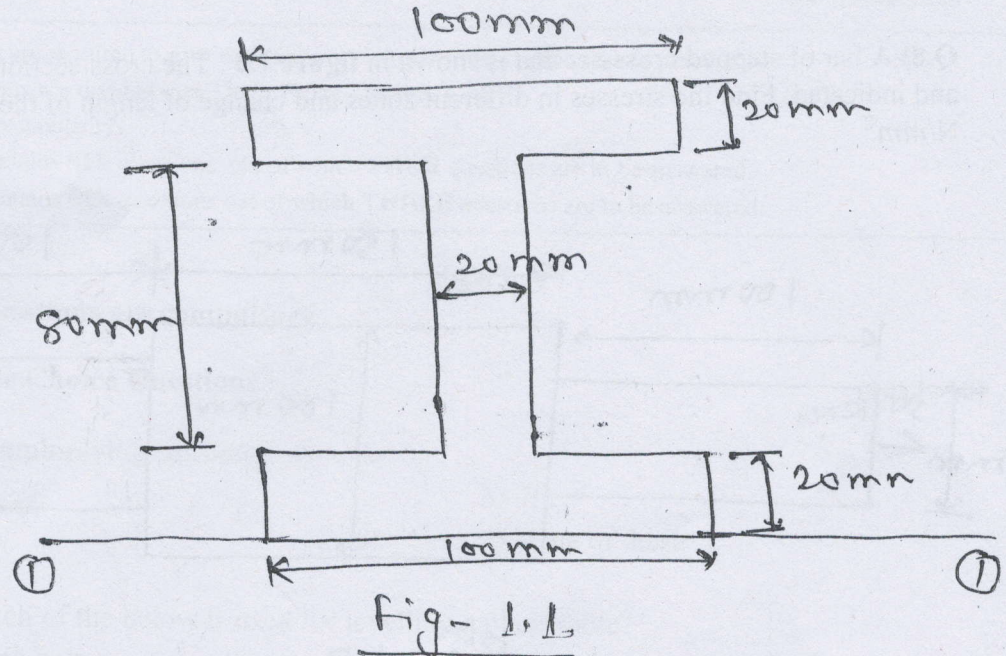
- Explain Stress & Strain and also explain its types?
- Draw Stress - Strain diagram & Explain each and every point ?
- Define shear force & Bending Moment diagram?
- Explain types of Beam with neat sketch?
- What is Moment of Inertia & radius of gyration?
- Explain Thermal stress ?

PART C

Answer any three:

(3x10=30)

Q.3) Find the Moment of Inertia of given fig -1.1 about the axis 1-1?

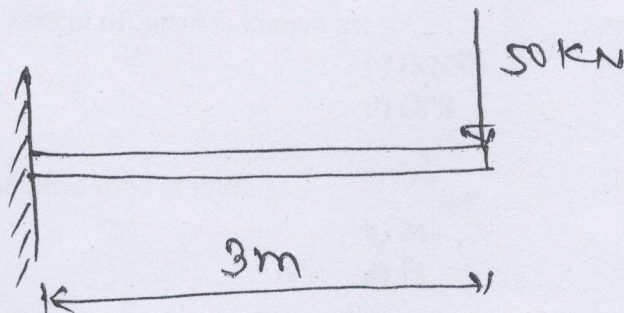


Q.4) a) Define poisson's Ratio?

b) A bar of uniform diameter 40 mm and length 2.5 m is subjected to an axial tension of 150 kN. If $E=210 \text{ KN/mm}^2$ and $\mu=0.3$, find the extension of the bar, change in diameter and change in volume.

Q.5) a) Define Shear Force & Bending Moment diagram

b) Draw S.F.D. & B.M.D. of given Fig-1.2



Q.6) a) Define Perpendicular axis Theorem & Parallel axis Theorem?

b) What are the assumption of theory of simple bending ?

Q.7) a) What are the assumption of Torsion?

b) A circular shaft of 50mm diameter is required to transmit torque from one shaft to another. Find the safe torque, which the shaft can transmit, if the shear stress is not to exceed 40 Mpa.

| Instrument Station | Staff Reading On | Distance (m) | Stadia Reading | |
|--------------------|------------------|--------------|----------------|-------|
| | | | Lower | Upper |
| O | A | 150 | 1.255 | 2.750 |
| | B | 200 | 1.000 | 3.000 |
| | C | 250 | 0.750 | 3.255 |

Q.7) What are the errors involved in Stadia Tacheometry? Explain

Q.8) Two tangents intersect at a chainage of 1250m, the angle of intersection being 150° . Calculate all the necessary data for setting out a circular curve of radius 250m. Use the Rankine's Method. Take peg interval of 20m.



ARKA JAIN University, Jharkhand

4th Semester Final Examination – 2018-19

Subject : Transportation Engineering-I

Course: Civil
Full Marks : 70
Pass Marks: 28

Time : 3 Hours

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PART A

Q.1) All questions are compulsory

A) Multiple Choice Questions :

(10x1=10)

- i) The Central Road Research Institute (CRRI) was formed in which year?
a) 1928
b) 1995
c) 1929
d) 1950
- ii) Which of the following volatile material is used in RC0-RC5 type cutback?
a) Gasoline
b) Water
c) Kerosene
d) Diesel
- iii) As per IRC recommendations, reaction time of driver is:
a) 2sec
b) 2.5sec
c) 1.5sec
d) 3sec
- iv) The correct order is:
a) OSD > SSD > ISD
b) SSD > ISD > OSD
c) OSD > ISD > SSD
d) All of these
- v) Highway Design is based on which type of transition curve?
a) Spiral
b) Lamniscate
c) Cubic Parabola
d) none of these
- vi) According to 1st Road Development Plan, the suggested road density is:
a) 82km/100km²
b) 32km/100km²
c) 16km/100km²
d) 40km/100km²
- vii) What is the number of conflict points in case of a 2way traffic-2 lane road intersection?
a) 24
b) 16
c) 6
d) 11
- viii) Which of the following is not a type of island?
a) Divisional
b) Channelizing
c) Rotary
d) Marking
- ix) Equivalency Factor for converting into PCU of a bicycle is:
a) 1.0
b) 2.0
c) 3.0
d) 0.5

x) Minimum thickness of Road Marking should be:

- a) 10cm
- b) 10mm
- c) 2.5cm
- d) 15cm

B] Very Short question

(5x2=10)

- a) What are the grades of Cutback Bitumen?
- b) Define PCU.
- c) Why are overtaking zones provided?
- d) What are the different types of road patterns commonly used in India?
- e) Enlist the different types of Traffic Control Devices.

PART B

Q2. Answer any four:

(4x5=20)

- i) Explain Jayakar Committee Recommendations. What are the types of roads according to Nagpur Road Development Plan?
- ii) Draw the cross section of a highway in embankment and indicate all the necessary elements.
- iii) Explain the Ductility Test of bitumen in detail.
- iv) Enlist the desirable properties of aggregates and bitumen used in highway.
- v) Explain in detail the drainage considerations of highway.
- vi) Explain in details the PIEV Theory?

PART C

Answer any three:

(3x10=30)

Q.3)

- (a) Explain the different types of signals used in Traffic Control.
- (b) What do you mean by conflict points? Draw a diagram to illustrate the number of conflict points in a one way-two way traffic intersection in a 2-lane road.

Q.4) Enlist the types of pavement failures in flexible & rigid pavement with diagram and a suitable reason for the same.

Q.5) What are the different forms of Bituminous Materials? With the help of a neat diagram, explain the extraction of bituminous materials from petroleum.

Q.6) Calculate the minimum sight distance required to avoid head on collision of two cars approaching from opposite direction at 90kmph and 50kmph respectively. Assume reaction time of 2.5sec and coefficient of friction as 0.8. Take braking efficiency as 50%.

Q.7) Derive an equation for Overtaking Sight Distance based on IRC recommendations.

Q.8) The design speed for a 2-lane road is 80kmph. When a design vehicle with a wheel base of 6.6m is negotiating a horizontal curve on that road. The off-tracking is measured as 0.096m. What is the required extra widening in this condition?



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4th Semester Final Examination – 2018-19

Subject : Geotechnical Engineering

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Course: Civil

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PART A

Q.1) All questions are compulsory

A] Multiple Choice Questions :

(10x1=10)

i) For a fully saturated soil condition, value of degree of saturation is:

- a) 1
- b) 0
- c) 0.7
- d) 0.5

ii) If the value of a_c is 0.74 then the value of s will be

- a) 1.74
- b) 0.36
- c) 0.26
- d) 0

iii) A consolidated soil in general is a case of ?

- a) 2 phase system
- b) 3 phase system
- c) 1 phase system
- d) Multi phase system

iv) Which of the type of boring is not used in case of rocks?

- a) Calyx boring
- b) Auger boring
- c) Rotary boring
- d) None of these

v) Which of the type of geosynthetics have large field of applications?

- a) Geogrid
- b) Geotextile
- c) Geomembrane
- d) Geosynthetic Clay Liner

vi) SC stands for:

- a) silty sand
- b) sandy silt
- c) clayey sand
- d) clayey silt

vii) GW-GC stands for?

- a) Well graded gravel containing clay
- b) Well graded gravel containing sand
- c) Well graded gravel containing silt
- d) Poorly graded gravel containing silt

viii) In SPT, number of blows are counted for the:

- a) First 300mm penetration
- b) last 300mm penetration
- c) First 450mm penetration
- d) last 450mm penetration

