

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

**Course Code: CE401**

**Course Name: - DESIGN OF STEEL STRUCTURES**

Max. Marks: 100

Duration: 3 Hours

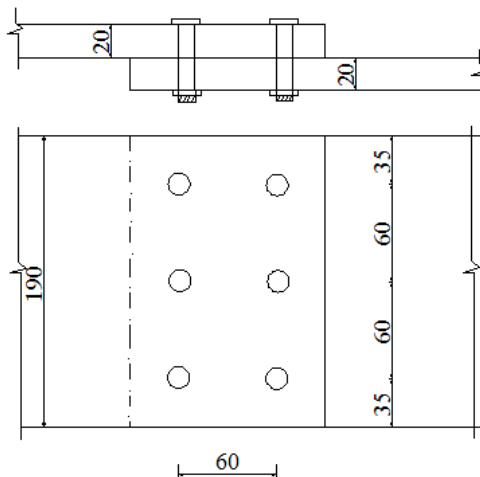
*(Use of IS800, IS875, IS883 are permitted)*

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

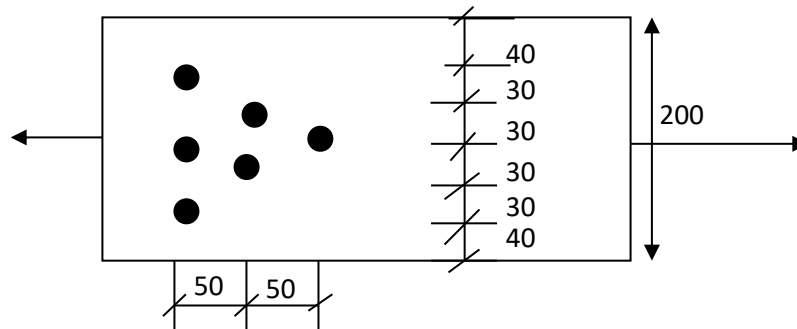
- 1 a) Sketch different types of bolted connections (3)
- b) Find the efficiency of the lap joint shown in Fig.1. Given M20 bolts of grade 4.6 (12)  
and Fe 410 plates are used.



Dimensions in mm

Fig.1

- 2 a) Explain different types of weld (3)
- b) Determine the tensile strength of ISA 125 x 95 x 8 mm connected to the gusset plate of 10mm through the shorter leg by 4, M20 bolts arranged in one row. The grade of steel is Fe410. Take  $p = 65$  mm, Edge & End distance = 40mm (12)
- 3 a) Explain the purpose of lug angles in tension member connection? (3)
- b) Determine the design tensile strength of the plate 200 x 10mm with the holes as shown below if the yield strength and ultimate strength of steel are 250MPa and 410MPa. M20 bolts and 10mm thick gusset plates are used. (12)



### PART B

*Answer any two full questions, each carries 15 marks.*

- 4 a) Design a column 10 m long to carry a factored axial load of 1100kN. The column is restrained in position but not in direction at both ends. Design a batten system for the column. Assume that the two channels are kept back to back. (15)
- 5 a) Explain the failure modes of axially loaded columns (5)
- b) Determine the design load capacity of the column ISHB 300@577 N/m if the length of the column is 3m and its both ends are hinged. (10)
- 6 a) What are the cross section classification defined in IS 800-2007 based on slenderness of plate elements? (3)
- b) Design a simply supported beam of 10m effective span carrying a total factored load of 60kN/m. The depth of beam should not exceed 500mm. The compression flange of beam is laterally supported by floor construction. Assume stiff end bearing is 75mm. (12)

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Determine the design forces in the members of a Fink type roof truss for an industrial building for the following data. Overall size of building : 48 x 16m., C/c spacing of trusses: 8m , Rise of truss : 1/4 of span , Self weight of purlins : 318 N/m., Height of columns : 11m. Roofing : A C sheets (171N/m<sup>2</sup>), Location : Agra. (20)
- 8 a) Derive the expression for calculating the force **F** in a bolt subjected to a factored load **P** at an eccentricity **e**. The line of action of the load is in the plane of the bolted connection and the centre of gravity of the connection is the centre of rotation. (4)
- b) The trusses for a factory building are spaced at 6 m c/c. and the purlin is spaced at (16)

2m c/c. The pitch of truss is  $28^\circ$  and span of truss is 18m. The roof consists of asbestos sheets with  $150 \text{ N/m}^2$ . Design a suitable I section purlin

- 9 a) Design a beam of clear span 3m at spacing of 1.5m in a roof. The bearing at each end is 30cm. The dead load of roof covering is  $2 \text{ kN/m}^2$  and live load is  $2.5 \text{ kN/m}^2$ . Assume that teak wood is used. (15)
- b) Classify the timber based on grades, modulus of elasticity, durability, location and treatability. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE401**

**Course Name: - DESIGN OF STEEL STRUCTURES**

Max. Marks: 100

Duration: 3 Hours

*(Use of IS 800, IS875, IS883 are permitted. Assume suitable data wherever necessary)*

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- |   |  |      |
|---|--|------|
| 1 | a) What do you mean by prying forces?  | (3)  |
|   | b) Design a double cover joint between the two plates of width 300 mm, if the thickness of one plate is 18 mm and the other is 10 mm. The joint has to transfer a working load of 260 kN. The plates are of Fe 410 grade. Use bolt of grade 4.6. | (12) |
| 2 | a) A tie member of a roof truss consisting of an angle section ISA 75 x75x10 of Fe 410 grade, is welded to a 10mm thick gusset plate. Design a weld to transmit a load equal to full strength of the member. Assume shop welding.                | (10) |
|   | b) Under what circumstances do we use slot welds and plug welds?   | (2)  |
|   | c) Explain block shear failure.  | (3)  |
| 3 | a) What is a lug angle?  | (3)  |
|   | b) Design a bridge truss diagonal carrying a pull of 200kN using double angle section. The centre to centre distance of intersections is 3m. The member is subjected to reversal of stresses.  | (12) |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |  |      |
|---|--|------|
| 4 | a) Design a built-up column consisting of two channels placed back to back to carry an axial factored load of 1500 kN. Length of the column is 6m and the column is restrained in position but not in direction at both ends. Provide single lacing system with bolted connection. | (13) |
|   | b) What are the main purpose of lacings and battens?   | (2)  |
| 5 | a) Illustrate the different elements of plate girder.  | (5)  |
|   | b) Design a suitable slab base for a column section ISHB 200@ 365.9N/m supporting an axial load of 500 kN. The base plate is to rest on a concrete pedestal of M20 grade   | (10) |

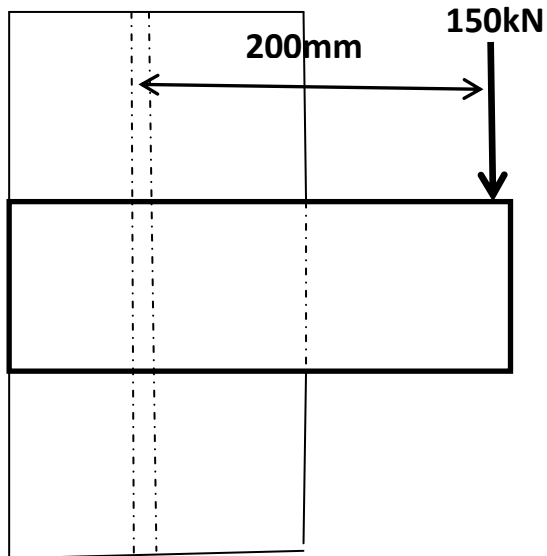
concrete. The load is transferred to the base plate by welded connection.

- 6 a) What is lateral torsional buckling of beams? (2)
- b) Design the simply supported main beam of a building supporting concrete floor slab with (13)  
the following data:  
Centre to centre distance of beams – 6m  
Span of beam – 7m  
Thickness of concrete slab – 240mm  
Finished screed – 40mm thick  
Weight of concrete slab and finished screed-  $24\text{kN/m}^3$   
Imposed load –  $4\text{kN/m}^2$

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Design a purlin on a sloping roof truss with the dead load of  $0.15\text{ kN/m}^2$ , a live load of  $2.5\text{ kN/m}^2$  and a wind load of  $0.6\text{ kN/m}^2$  (suction). The purlins are 1.8m centre to centre and a span of 3.8m, simply supported on a rafter at a slope of  $20^\circ$ . (16)
- b) A roof truss has a span of 20m and a rise of 4m is placed at 3.5m c/c. calculate the live load on the roof truss. (4)
- 8 a) The details of a shed situated in Thiruvananthapuram is given below (10)  
Span of truss – 15m  
Rise of truss – 4m  
Eaves height – 8m  
Spacing of truss – 3m  
Spacing of purlin – 4m  
Find the design wind pressure and wind load on purlin.
- b) Design the bracket connection shown below. The connection supports a load of 150kN. (10)  
The column section is ISHB 150@ 300.19N/m. The thickness of bracket plate is 10mm.  
Use M16 bolts of grade 4.6.



- 9 a) Design a beam of clear span 4m at spacing of 2 m centre to centre in a roof for a residential building. The bearing at each end is 250 mm . The dead load of roof covering is  $1.5 \text{ kN/m}^2$  and live load is  $3 \text{ kN/m}^2$ . Assume that deodar wood is used. (15)
- b) Explain briefly classification of timber. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

**Course Code: CE403**  
**Course Name: STRUCTURAL ANALYSIS - III**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

- |   |  | Marks  |
|---|--|--------|
| 1 | a) What are the assumptions in portal method of analysis?  | ( 2 )  |
|   | b) Analyse the frame shown in figure 1 using portal method | ( 13 ) |

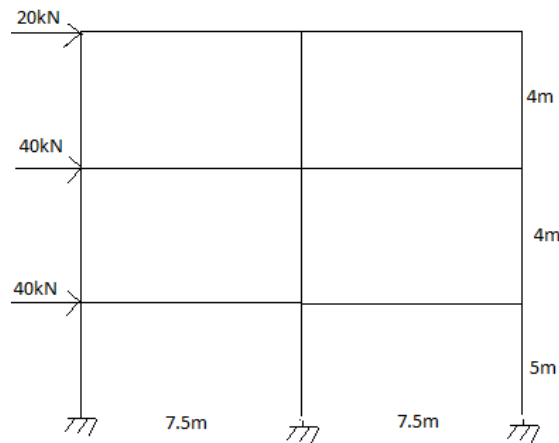


Fig 1

- |   |  |        |
|---|--|--------|
| 2 | a) Explain static, external and internal indeterminacy with examples.  | ( 5 )  |
|   | b) Explain the concept of physical approach  | ( 5 )  |
|   | c) Define kinematic indeterminacy. Compute the kinematic indeterminacy of a rigid jointed frame of column height 'h' and beam span 'l' with one end fixed and other end hinged, if only the beam axial deformations are neglected. | ( 5 )  |
| 3 | a) Compare the analysis by flexibility and stiffness matrix  | ( 10 ) |
|   | b) Explain the formulae to find out the static indeterminacy of pin-jointed and rigid-jointed frames   | ( 5 )  |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |  |        |
|---|--|--------|
| 4 | a) Explain the load transformation matrix approach in flexibility method           | ( 8 )  |
|   | b) Explain analysis of plane trusses by flexibility method                         | ( 7 )  |
| 5 | a) Analyse the plane frame shown in figure 2 by flexibility matrix method and draw | ( 15 ) |

the SFD and BMD. The bottom support is fixed and top support is roller.

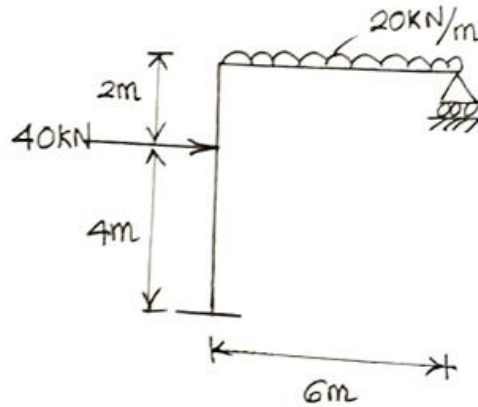


Fig 2

6 a) Define kinematic indeterminacy. Determine the kinematic indeterminacy of the following structures in Fig 3. (5)

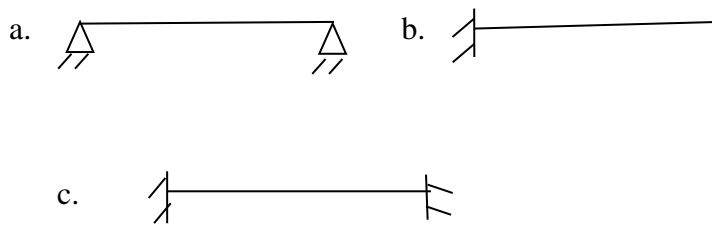


Fig.3

b) Analyse the truss shown in Fig. 4 (with active global coordinates, as shown) and find the joint displacements, support reactions and bar forces. The truss is subjected to direct loads  $F_1 = 50 \text{ kN}$ ;  $F_2 = 30 \text{ kN}$ , and a lack of fit due to bar AC being too long by 5 mm. Assume all bars to have same axial rigidity  $AE = 6000 \text{ kN}$ . Use stiffness matrix method. (10)

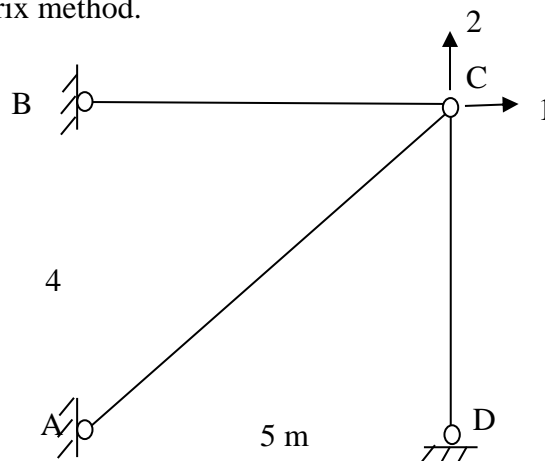


Fig 4



## PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Discuss the procedure of Direct Stiffness Method in the matrix analysis (5)  
 b) Analyse the continuous beam shown in figure 5 using Direct Stiffness Method (15)  
 shown in figure and develop the BMD

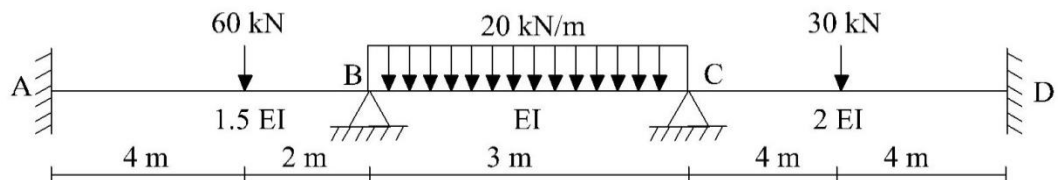


Fig 5

- 8 a) Explain Direct Stiffness Method in the matrix analysis (5)  
 b) Analyse the beam shown in figure 6 using Direct Stiffness Method shown in figure (15)  
 and determine the member forces and moments.

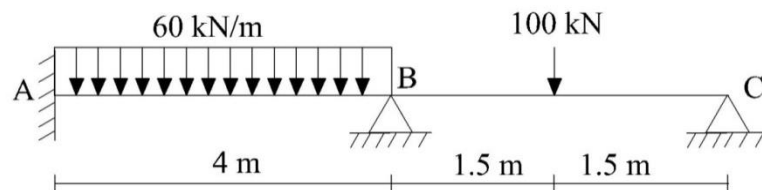


Fig 6

- 9 a) Write the equation of motions corresponding to the damped and undamped free and forced vibration. (5)  
 b) Derive the equations for response of SDOF system subjected to damped free vibration in 'x' direction with inertia constant  $m$ , spring constant  $k$  and damping constant  $c$ . Draw the response diagram also. (15)

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SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE403**  
**Course Name: STRUCTURAL ANALYSIS - III**

Max. Marks: 100

Duration: 3 Hours

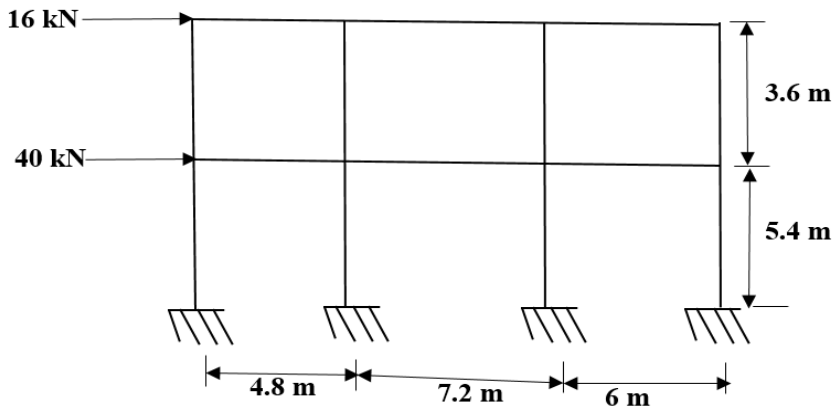
*Assume missing data if any and state it*

**PART A**

*Answer any two full questions, each carries 15 marks.*

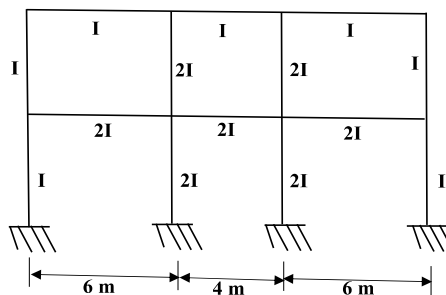
Marks

- 1 a) What are the assumptions involved in cantilever method? 3
- b) Analyse the frame in Figure.1 using portal method. Beams and columns have same size. 12



**Figure. 1**

- 2 a) Find the maximum hogging moment and shear force at the support due to gravity loading in the frame shown in Figure.2. Frames are spaced at 3.0 m c/c. Dead load = 3 kN/m<sup>2</sup>, Live load = 2 kN/m<sup>2</sup>, Weight of beam = 2 kN/m and storey height = 3 m. 10



**Figure. 2**

- b) Derive Flexibility matrix for the following beam element in Figure.3.

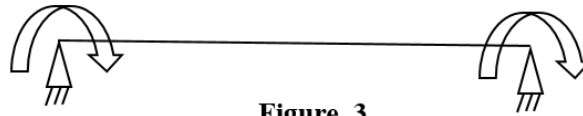


Figure. 3

5

- 3 a) Find the Kinematic indeterminacy and Static indeterminacy of the continuous beam ( Figure.4) , pin jointed frame (Figure.5) and rigid frame (Figure.6)



Figure. 4- Discard axial forces

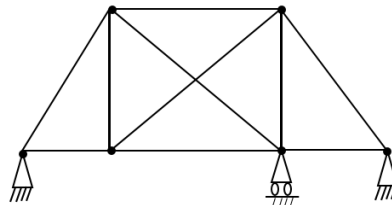


Figure. 5

9

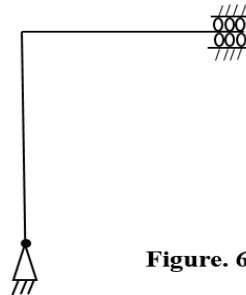


Figure. 6

- b) Derive Flexibility matrix for the truss element. 3  
 c) Define flexibility coefficient and stiffness coefficient. 3

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) Analyse the continuous beam shown in Figure.7, using flexibility matrix method and find the bending moments.

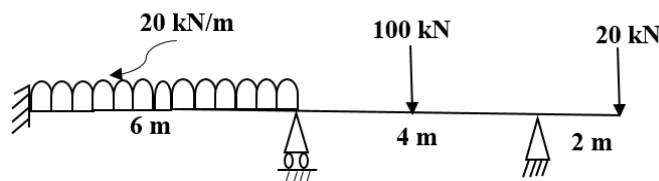
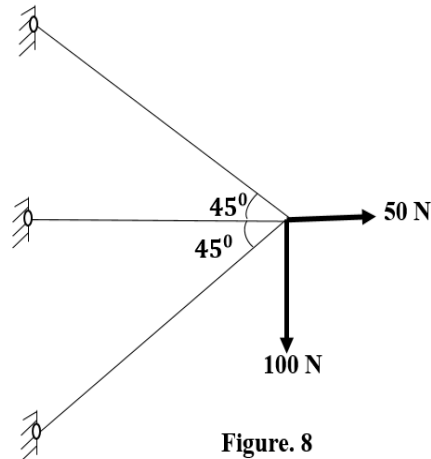


Figure. 7

15

- 5 a) Establish the relationship between flexibility matrix and stiffness matrix. 4  
 b) What is displacement transformation matrix? 5  
 c) What is lack of fit? Explain one method to estimate the member forces due to lack of fit using either flexibility or stiffness methods. 6
- 6 a) Find the member forces in the truss shown in Figure.8 using stiffness method. 15



### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Analyse and draw bending moment diagram for the frame shown in Figure.9 using direct stiffness method.

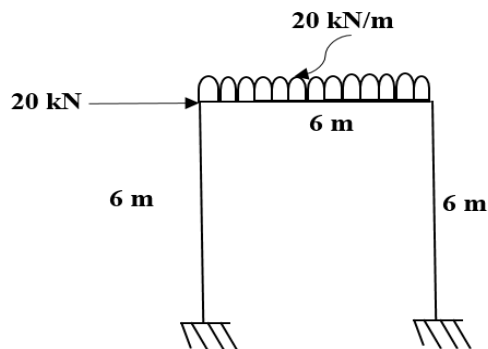


Figure. 9

- b) What is direct stiffness method? 3
- 8 a) Differentiate between local coordinates and global coordinates. 4  
 b) How global stiffness matrix can be derived from the element stiffness matrix? 6  
 c) Describe Vibration Isolation? What are the different types of vibration isolation? 10
- 9 a) What is critical damping? 3  
 b) What is magnification factor? 3

- c) A person standing on a spring produces a deflection of 1.0 mm to the spring. Find the natural frequency and Time period. 4
- d) A vibrating system consists of mass of 10 kg, spring of stiffness 240 N/m and a damper with a damper coefficient of 10 N-s/m. Determine 10
- i) Damping factor
  - ii) Natural frequency of damped vibration
  - iii) Logarithmic decrement
  - iv) Ratio of successive amplitudes
  - v) Number of cycles after which initial amplitude reduced to 25%

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

**Course Code: CE405**

**Course Name: ENVIRONMENTAL ENGINEERING- I**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) What are the various sources of water available on the Earth? (5)  
 b) What do you understand by the term 'Design Period'? (5)  
 c) Write a note on variation in rate of demand. (5)
- 2 a) Explain Graphical comparison method of population forecasting. (5)  
 b) The following is the population data of a city available from past census records. (10)  
 Determine the population of the city in 2021 by (a) arithmetical increase method  
 (b) geometrical increase method (c) incremental increase method.

Year	1941	1951	1961	1971	1981	1991	2001
Population	12500	17000	27000	42000	58000	68000	74000

- 3 a) Prepare a standard chart giving the drinking water quality standards for any 10 (5)  
 parameters as per BIS.  
 b) With the help of neat sketches, describe any two types of intakes? (5)  
 c) Explain any five chemical characteristics of water. (5)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) What is meant by coagulation? Enumerate the different coagulants used. (5)  
 b) Design a continuous flow rectangular sedimentation tank for a population of (10)  
 20,000 persons with an average per capita demand of 120 litres per day. Assume  
 detention period of 6 hours.
- 5 a) Design a clariflocculator for treating 3 MLD of water. Make suitable (15)  
 assumptions. Prepare a neat sketch.
- 6 a) Explain the theory of filtration. (4)  
 b) With a neat sketch, explain the working of a slow sand filter. (6)  
 c) Compare slow sand and rapid sand filters. (5)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) What are the requirements of a good disinfectant. (4)  
b) Explain the theory of chlorination. (6)  
c) Explain different types of chlorination. (10)
- 8 a) Give an account on Ion Exchange Process. Explain its advantages also. (10)  
b) How can you remove permanent hardness by Lime Soda Process? (10)
- 9 a) What are the requirements of a good distribution system? (5)  
b) Write short note on the different layout of distribution networks. (10)  
c) Explain the equivalent pipe method with neat sketch. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019**

**Course Code: CE407**

**Course Name: TRANSPORTATION ENGINEERING - II**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- |   |   |      |
|---|---|------|
| 1 | (a) Sketch the typical cross section of B.G. track on embankment  | (5)  |
|   | (b) Describe the functions and requirements of ballast  | (10) |
| 2 | (a) What is coning of wheel? Why is it necessary for rail wheel interactions?   | (5)  |
|   | (b) A $8^\circ$ curve diverges from a main curve of $5^\circ$ in an opposite direction in the layout of a BG yard, calculate the super elevation and speed on the branch line, if the maximum speed permitted on the main line is 45km.p.h. | (10) |
| 3 | (a) What is meant by super elevation? What are the objects of providing SE on curves?   | (4)  |
|   | (b) Compare and differentiate the different types of rails with neat sketches.  | (6)  |
|   | (c) What are the various causes of creep?   | (5)  |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |  |      |
|---|--|------|
| 4 | a) Draw a sketch showing positions of various signals for a junction of two main line and two branch lines with a siding   | (5)  |
|   | b) What is a yard? What are the different types of yards? Explain the functions of a Marshalling yard and describe the points to be considered in its design.                            | (10) |
| 5 | a) A 1 in 8.5 crossover is laid between 2 BG parallel tracks with their centres 5m apart. Find length of straight track and overall length of the crossover.                             | (5)  |
|   | b) Explain different types of railway signals according to their function. With the help of neat sketch explain the essential features and working principle of a Semaphore type signal. | (10) |
| 6 | a) Differentiate between 'Daily maintenance' and 'Periodic maintenance'  | (4)  |
|   | b) Write short notes on warner signal, Shunting signal, and routing signal with neat sketches  | (6)  |
|   | c) What is Through packing and Scissor Packing? List the difference between them   | (5)  |



**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) Classify harbours on the basis of utility and explain the uses and requirements of them. (10)
- b) How is transferring of center line into the tunnel carried out? Explain with the help of neat diagram (10)
- 8 a) What is a bulk head? Explain shield method of tunnelling through water bearing soils (10)
- b) What is a dry dock? What are the classifications of dry dock? Explain in detail, any two types of dry docks with neat sketches. (10)
- 9 a) Explain the requirements of a good harbour. (5)
- b) Write short note on: (10)
- (i) Spring and Neap Tide
  - (ii) Littoral Drift
  - (iii) Tidal Bore
  - (iv) Offshore moorings
- c) Enumerate the various ship characteristics that affect the harbour design. (5)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE407**

**Course Name: TRANSPORTATION ENGINEERING - II**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- |   |   |      |
|---|---|------|
| 1 | (a) What is the equilibrium cant on a $2^0$ curve on a BG track, if the speed of various trains are 10 trains at 50km.p.h., 8 trains at 55 km.p.h. and 4 trains at 60km.p.h. respectively | (5)  |
|   | b) Describe the functions and requirements of sleepers  | (10) |
| 2 | a) What is meant by Super elevation? What are the objects of providing SE on curves?  | (5)  |
|   | b) What is creep? What are the various causes of creep? List the various remedial measures  | (10) |
| 3 | a) Explain the term ballast less tracks and explain its advantages.   | (4)  |
|   | b) What are the factors affecting the selection of gauges?  | (5)  |
|   | c) Compare and differentiate the different types of rails with neat sketches.   | (6)  |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |   |      |
|---|---|------|
| 4 | a) Discuss on Conventional and Advanced Remedial Aids for preventing railway accidents.   | (5)  |
|   | b) Explain different types of railway signals according to their operational characteristics. With the help of neat sketch explain the essential features and working principle of a Semaphore type signal. | (10) |
| 5 | a) Draw a neat sketch of a Right hand turnout and mark its components.  | (5)  |
|   | b) What is a yard? What are the different types of yards? Explain the functions of a Marshalling yard and describe the points to be considered in its design.   | (10) |
| 6 | a) Explain (i) Three-throw (ii) Gathering lines   | (4)  |
|   | b) Explain locomotive yard and its components   | (5)  |
|   | c) What are the different systems of controlling the movement of trains? Explain the working of absolute block system.  | (6)  |

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) What is an air lock? Describe the air lock method of tunnelling in soft soil (10)
- b) Write short note on (i) Spring and Neap Tide (iii)Littoral Drift (iv) Tidal Bore (10)  
(v)offshore moorings
- 8 a) How is transferring of center line into the tunnel carried out? Explain with the (10)  
help of neat diagram
- b) State the natural and meteorological phenomena a harbour engineer has to study (10)  
and briefly mention the effects of these phenomena
- 9 a) Write short notes on (10)
- a) Wet Docks
- b) Navigational aids
- b) Write down the procedure for constructing a tunnel in water bearing soil. Explain (10)  
its advantages.(Draw necessary diagrams)

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**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), MARCH 2020

**Course Code: CE407**

**Course Name: TRANSPORTATION ENGINEERING - II**

Max. Marks: 100

Duration: 3 Hours

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- |   |  |     |
|---|--|-----|
| 1 | a) What are the modern developments in Railways  | (8) |
|   | b) Explain track-alignment? What are the factors which control the alignment of a railway track?   | (7) |
| 2 | a) Write the different types of rail section. Mention relative merits and demerits of flat footed rails and bull headed rails.   | (5) |
|   | b) What should be the actual ruling gradient if the ruling gradient is 1 in 130 on a MG and a curve of 4 degree is super imposed on above track section?   | (5) |
|   | c) Explain in brief LRT and MRTS.  | (5) |
| 3 | a) From a BG yard an 6° curve branches off from a 3° main curve. If the speed is restricted to 35 km/h in the branch line and the permissible value of cant deficiency is 75 mm, determine the speed restriction on the main line. | (8) |
|   | c) What is creep? What are the causes and effects of creep?  | (7) |

**PART B**

*Answer any two full questions, each carries 15 marks.*

- |   |   |     |
|---|---|-----|
| 4 | a) A turnout is to be laid off a straight BG track with a 1 in 12 crossing. Determine the lead and radius of turnout with the help of following data: heel divergence = 133mm, crossing angle 4°45'49", switch angle 1°8'0", straight length between the theoretical nose of crossing and tangent point of crossing = 1.418m. | (8) |
|   | b) Explain the procedure of 'Through packing' and 'Scissor packing' and highlight the difference between them.  | (7) |
| 5 | a) Describe the various possible causes which may result into a railway accident and suggest the possible remedies for each   | (8) |
|   | b) What are the different systems of controlling the movement of trains? Explain the working of one system which has been widely used on Indian Railways.   | (7) |

- 6 a) Explain with neat sketch Reception signal and Departure signals (5)  
b) Explain the procedure of periodic track maintenance in detail. (5)  
c) Differentiate between C.T.C. system and A.T.C. system (5)

**PART C**

*Answer any two full questions, each carries 20 marks.*

- 7 a) What are the requirements of a good harbour? (10)  
b) Compare mound type break water with wall type breakwater with the help of sketches (10)
- 8 a) Explain the shield method of tunnelling with help of a sketch (10)  
b) What is the necessity of railway tunnel? Draw a sketch to illustrate a single track railway tunnel? (10)
- 9 a) Explain in detail the procedure of providing drainage and ventilation in tunnels. (10)  
b) Write short notes on: (10)  
(i) Moorings  
(ii) Wharves  
(iii) Transit Shed  
(iv) Quays

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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

**Course Code: CE409**  
**Course Name: QUANTITY SURVEYING AND VALUATION**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any two full questions, each carries 10 marks.*

Marks

- 1 a) List different type of estimates (4)
- b) Work out the quantity of given materials required for 1:1.5:3 concrete and analyse the unit rate using the details given below: (6)

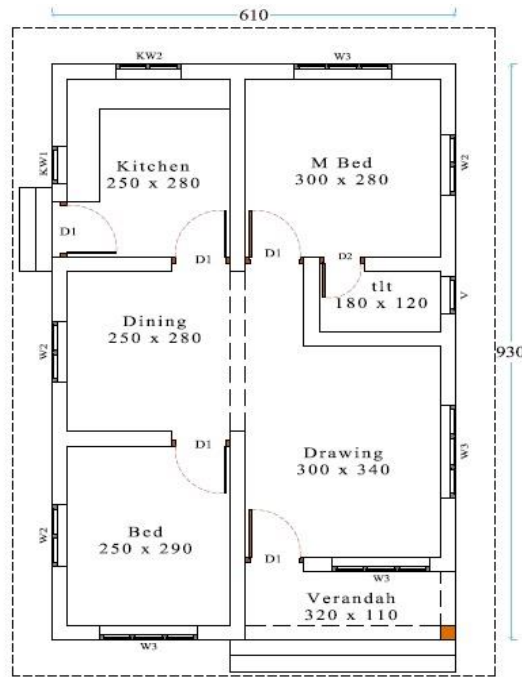
Description	Quantity	unit	Rate Rs.	unit
20mm (nominal size) broken stone	?	m <sup>3</sup>	1300.00	m <sup>3</sup>
Sand	?	m <sup>3</sup>	1200.00	m <sup>3</sup>
Cement	?	Tonne	5700	Tonne
Mason	0.200	Nos	500.00	Each
Man	1.000	Nos	450.00	Each
Women	3.500	Nos	450.00	Each
Man for lifting materials	0.200	Nos	450.00	Each

- 2 a) List the essential documents to be accompanied with the detailed estimate (6)
- b) What is mean by overhead charges? Give the percentage adopted for the contractor's profit and overhead in CPWD DSR 2016 rate analysis. (4)
- 3 Write the detailed specification for brickwork in cement mortar 1:5. (10)

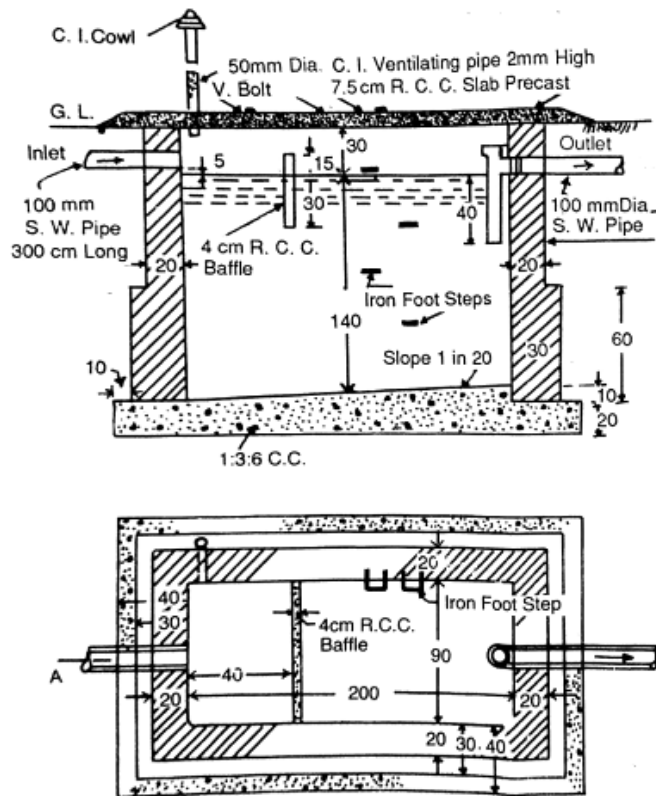
**PART B***Answer any two full questions, each carries 25 marks.*

- 4 Prepare detailed estimate for the following items of work for the construction of residential building (25)
- (a) RRM for foundation (75cm x 75cm) and basement 50cm x 50cm , Wall thickness 20cm
- (b) Quantity of earth filling inside the plinth
- (c) RCC works for slab (12cm thick), lintel (15cm thick), and sun shade (60cm projection).
- (d) Painting for walls, doors(D1-100x210; D2 80x210) and windows (W2-100x150; W3-150x150;KW1-50x100;KW2-100x100); V(90x60).

All dimensions are in centimetres. Any missing data may be suitably assumed.



- 5 Prepare a bar bending schedule and quantities of RCC and reinforcement of a simply supported beam of length 6.5 m , depth 50 cm, and width 30 cm reinforced with 3 Nos of 20 mm dia at bottom as straight bar, 2 Nos of 20 mm dia cranked at 45° , 2 Nos 16 Φ at top of beam and 8 mm Φ 2 legged stirrups @ 15 cm c/c (25)
- 6 Prepare a detailed estimate of a Septic tank from the given drawings. (25)



**PART C**

*Answer any two full questions, each carries 15 marks.*

- 7 a) Explain valuation and its purpose? (5)  
b) What are the methods for calculating depreciation? (10)
- 8 a) Discuss about different methods for finding valuation of a building (8)  
b) The cost of construction of a new building according to present market rate is Rs. 80,000/- having a life of 70 years. But if the building is 15 years old determine the depreciation amount which should be deducted from the cost of the new building at 6% compound interest. (7)
- 9 a) A building is constructed at a cost of Rs.2,50,000 on a land purchased at Rs. 50,000. The owner of the property expects a return of 9% on the cost of construction and 8% on the cost of land. The building is estimated to have a future life of 60years at the end of which it requires Rs.3,25,000 for constructing a new building in its place. Determine the standard rent of the property given:  
i. Rate of interest for sinking fund at 6%  
ii. Annual repairs at 1.5% of cost of the construction  
iii. All other outgoings 28% of the net income of the property  
Scrap value at the end of the useful life of the building as 10%. (9)
- b) Define salvage value, Scrap value, capitalised value and obsolescence (6)

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Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE409**

**Course Name: QUANTITY SURVEYING AND VALUATION**

Max. Marks: 100

Duration: 3 Hours

**Instruction :** Assume any missing data suitably

**PART A**

*Answer any two full questions, each carries 10 marks.*

Marks

- 1 a) Explain the use of CPWD schedule of rates and how it is applied for the construction work in the different states of India. (7)
- b) Write the unit of measurement of (i) DPC using waterproofing compound (ii) Iron work for window (iii) Water proof Painting above roof slab (3)
- 2 a) Calculate the amount required for carriage of 2500kg of steel reinforcement to be brought from a source of 6km away from the site. The vehicle access is only upto 75m away from the construction site. (5)
- CPWD data are as follows for mechanical transport of 1 tonne of steel at 1km@Rs.69.93; 2km@Rs.79.29; 5km@Rs.106.07; beyond 5km upto 10km per km @Rs.7.72 ; and for transport of 1 tonne of steel by manual labour Rs.144.20/- for first 50meters and Rs.21.16/- for every additional 50metre or part thereof.
- b) Reproduce detailed specification of Earthwork excavation for foundation in ordinary soil. (5)
- 3 a) Develop rate analysis for DSR item No.5.3, Reinforced cement concrete work with 1:1.5:3 (3 graded stone aggregate 20 mm nominal size) in beams, suspended floors, roofs having slope up to 15° landings, above plinth level up to floor five level, excluding the cost of centering, shuttering, finishing and reinforcement. (8)
- Material :** 20mm Aggregate  $0.57\text{m}^3 @ ₹1300/\text{m}^3$ , 10mm  $0.28\text{m}^3 @ ₹1300/\text{m}^3$ , coarse sand (Zone III)  $0.425\text{m}^3 @ ₹1200/\text{m}^3$ , Portland cement 400kg@₹5700/tonne.
- Labour :** Mason  $0.24 @ ₹467/\text{day}$ , Beldar  $2.75 @ ₹368/\text{day}$ , Bhisti  $0.90 @ ₹407/\text{day}$ , Coolie  $1.88 @ ₹368/\text{day}$
- Carriage provisions :** Stone aggregate below 40mm  $0.85\text{m}^3 @ ₹103.77/\text{m}^3$ , Coarse sand  $.425\text{m}^3 @ ₹ 103.77/\text{m}^3$ , Portland cement  $0.40\text{tonne} @ ₹.92.24/\text{tonne}$
- Hire Charges** for concrete mixer  $0.08 @ ₹800/\text{day}$ , Vibrator needle type  $₹0.08 @ 350/\text{day}$
- Sundries (LS)**  $14.30 @ ₹1.73$ .
- Adopt water charges, contractor profit and overheads as per the CPWD DSR2016 provisions.
- b) List any four item generally considered under overhead charges. (2)

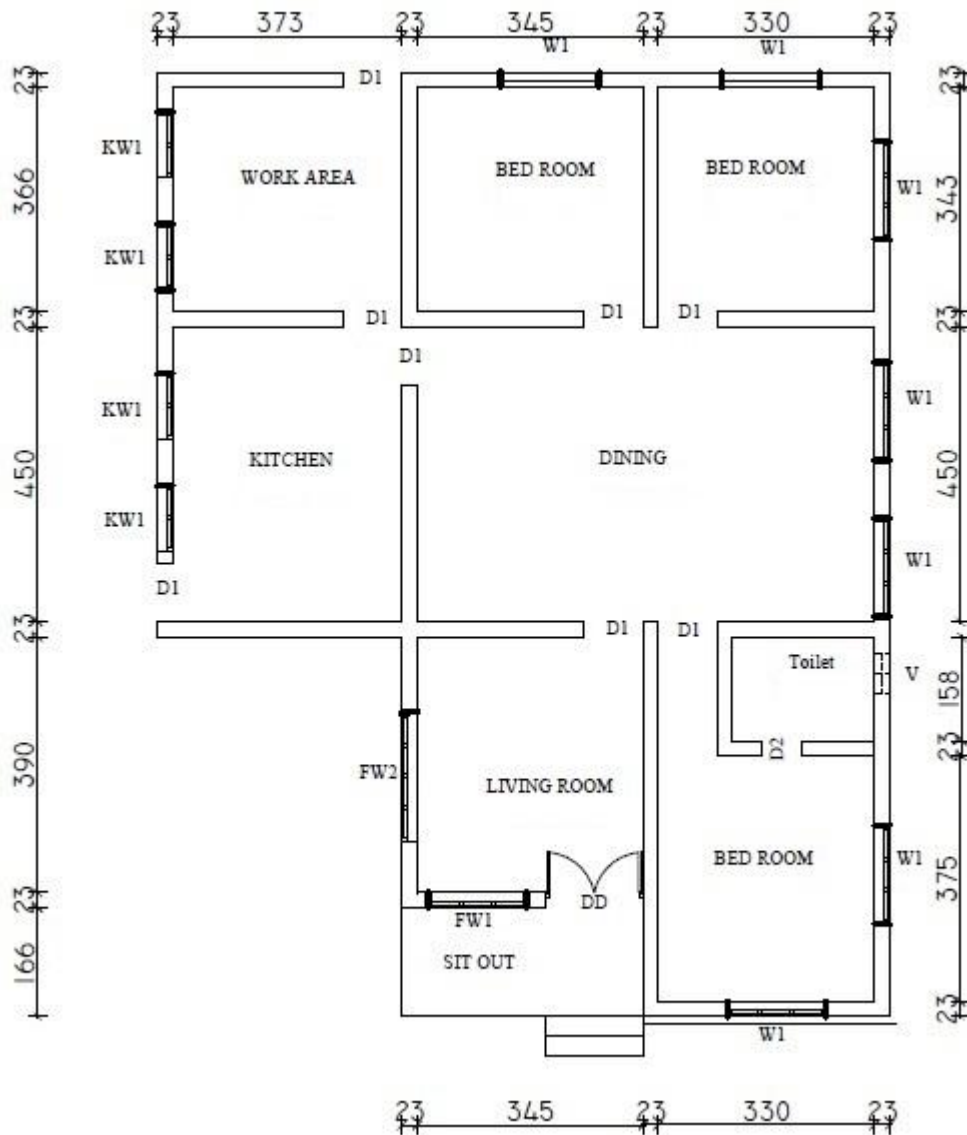
**PART B**

*Answer any two full questions, each carries 25 marks.*

- 4 Prepare the detailed estimate of the following items of the building plan shown in Figure-1. (25)

Use Centre line method

- i) Earth work excavation for foundation in ordinary soil.
- ii) Brick work in CM 1:4 for super structures
- iii) RCC 1:2:4 for roof and lintel
- iv) Flooring with cement concrete 1:4:8, 40mm nominal size brokenstone,75mm thick.
- v) Wood work for door frames



**Figure-1**

Assume any missing data suitably.

PCC 90cm wide and 10cm thick, Foundation 80cm wide x 75cm deep & Basement 45cm x 45cm.

Wall height 3m, All round lintel of size 23cm x 15cm provided, roof slab thickness 12cm, roof projection 10cm from outer wall.

Door & Windows (DD 110x210cm; D1 90x210cm; D2 75x210cm; W1 150x150cm; KW1 100x120cm; V 60 x 60 cm; FW1 120 x 200cm; FW2 160x200cm)

All dimensions are in Centimeter

- 5 a) Prepare a bar bending schedule for the column shown in the figure-2 and find out the total quantity of steel reinforcement required. Column Size 40cmx40cm, Base footing 2.1m x2.1m. (20)

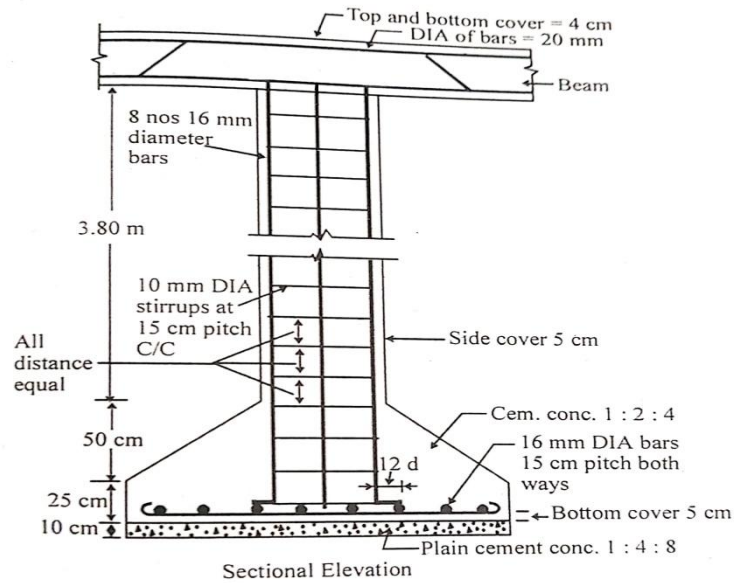


Figure-2

- b) In a simply supported beam of depth 450mm is provided with a 3, 20mm diameter bar at bottom, in this one bar is provided as bendup bar near both the supports. 10mm stirrups are provided with top and bottom cover 25mm. Calculate the additional length provided for bend up in both end. If the (i) bendup angle is 45° and (ii) bendup angle is 30°. (5)
- 6 a) Calculate the quantity of earth work for a portion of road of length 700m. (15)  
 Formation width of road is 8m, side slope in banking 2: 1 and 1:1 in cutting, road has a down gradient of 1 in 150, formation level 260 at distance 0.

Distance (m)	0	100	200	300	400	500	600	700
Reduced Level	261.10	261.20	260.90	262.20	260.80	260.70	260.30	260.40

- b) Prepare the detailed estimate of following items of a septic tank given below (Figure 3) (10)
- 1). Earth work in excavation
  - 2). R.C.C work 1:1 ½:3
  - 3). Plastering in C.M 1:3

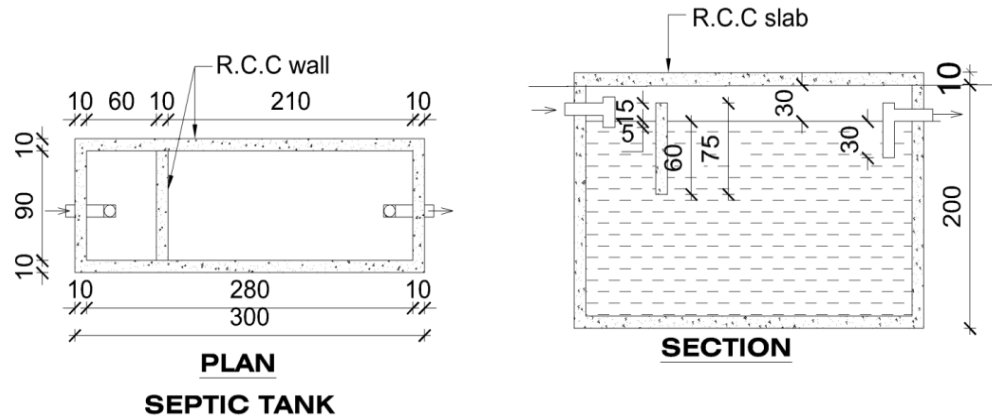


Figure-3

**PART C**

*Answer any two full questions, each carries 15 marks.*

- 7 a) List different type of Value. Give brief description of any three type. (5)
- b) The cost of a newly constructed building was ₹.25,000,00/-. The life of the building is 75years. Determine the depreciated cost in the 30<sup>th</sup> year of life by straight line method and constant percentage method. The scrap value of the building is 10% of its construction cost. (10)
- 8 a) In a plot of land costing Rs. 45 Lakhs, a building has been newly constructed at total cost of Rs.70 Lakhs. The building consists of 8 flats for 8 tenants. The owner expects 8% return on the cost of construction and 6% return on the cost of land. Calculate the standard rent for the each flat of the building assuming life of building is 70 years, sinking fund 4% interest, 1% annual repair cost and 30% of the outgoings of the net return. (12)
- b) Write the difference between depreciation and obsolescence (3)
- 9 a) Explain valuation and its importance. (3)
- b) Workout the valuation of a commercial building with the following data: Cost of land for life-time period of building is ₹.5,20,000/-. Gross income per year is ₹.8,50,000/-Expenses required per year: (a) staff salary, electric charges, municipal taxes including licenses fees, stationery and printing etc. is 20% of the gross income. (b) For repair and maintenance of lift, furniture etc. @ 5% of their capital cost of ₹.10,50,000/- (c) sinking fund for the items considered in capital cost, whose life is 25years @4% after allowing 10% scrap value. (d) Insurance premium is ₹.25,000/- per year. Take year's purchase @8% and annual repair of the building @2% on gross income. (12)

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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE467**

**Course Name: HIGHWAY PAVEMENT DESIGN**

Max. Marks: 100

Duration: 3 Hours

*(Use of IRC 37-2012, IRC 58-2002/2011 and design charts permitted)*

**PART A**

*Answer any two full questions, each carries 15 marks.*

Marks

- 1 a) How is Subgrade strength assessed for design of flexible pavements? Briefly explain the test procedure. (5)
- b) Why is it necessary to consider Lateral Distribution Factor (LDF) in the estimation of traffic loads in pavement design? Substantiate the answer with neat sketches (5)
- c) Plot the trend of following in a Marshall mix design a) Voids in Mineral aggregate v/s Bitumen content; b) Voids filled with bitumen v/s Bitumen content, c) Air voids v/s Bitumen content; d) Marshall Stability v/s Bitumen content; e) Marshall Flow v/s Bitumen content (5)
- 2 a) Explain in detail the need and mix design procedure in mechanical soil stabilization. (10)
- b) Explain the concept of Equivalent Single Wheel Load (ESWL). How is ESWL determined using Equal Vertical Stress criterion (5)
- 3 a) A circular load having radius of 152 mm and uniform pressure 0.56 MPa is applied on two layer system. The subgrade has elastic modulus of 35MPa and can support a maximum vertical stress of 0.056 MPa. If bituminous layer has elastic modulus of 3500 MPa, what is the required thickness of a full depth pavement? (8)
- b) Explain how climatic variation affects pavement design and performance. (7)

**PART B**

*Answer any two full questions, each carries 15 marks.*

- 4 a) A plate bearing test using a 75cm plate was made on a subgrade as well as on 26cm of gravel base course. Unit load required to cause settlement of 0.5cm was  $0.67\text{kg/cm}^2$  and  $2.67\text{kg/cm}^2$  respectively. Determine the required thickness of base course to sustain 25000kg,  $6.67\text{ kg/cm}^2$  pressure and maintain a deflection of 0.5cm. (10)

- b) Discuss McLeod method of pavement design in detail. (5)
- 5 a) Explain briefly Winkler foundation used in the design of Concrete pavements. (5)
- b) List the various Empirical methods of Pavement Design? What are the drawbacks? (3)
- c) Discuss the nature of load and temperature induced stresses in a concrete slab during day time and night time. Which condition is considered to be critical in pavement design? (7)
- 6 a) Describe briefly the thermal stresses developed in Concrete slab due to seasonal variation of temperature (6)
- b) Briefly explain flexible pavement design method using IRC 37: 2012 (9)

### PART C

*Answer any two full questions, each carries 20 marks.*

- 7 a) Explain the principle and procedure of Benkelman Beam test. (10)
- b) IRC 58: 2002, for the design of JPCP pavements without tied shoulder, considers wheel load stresses to be critical when the tire imprint touches the longitudinal edge. Why? (5)
- c) How does load transfer occurs across a contraction joint in Jointed Plain Cement Concrete Pavements? (5)
- 8 a) Discuss briefly the quality control tests that a Highway Engineer needs to ensure during procurement of materials and immediately after construction of flexible pavements (10)
- b) Briefly outline IRC procedure for determining the thickness of cement concrete pavement (10)
- 9 a) A cement concrete pavement has a thickness of 18 cm and has two lanes of 7.2m with a longitudinal joint along the centre. Design the dimensions and spacing of the tie bar. Allowable working stress in tension =  $1400\text{kg/cm}^2$ , Unit weight of concrete =  $2400\text{kg/m}^3$ , Allowable bond stress in deformed bars in concrete =  $24.6\text{kg/cm}^2$  and coefficient of friction = 1.5 (8)
- b) Distinguish between Dowel and Tie bars used in JPCP. (6)
- c) Discuss in detail any one method each of Functional and Structural Performance assessment of Pavements (6)

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Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
SEVENTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019

**Course Code: CE469**  
**Course Name: ENVIRONMENTAL IMPACT ASSESSMENT**

Max. Marks: 100

Duration: 3 Hours

**PART A***Answer any two full questions, each carries 15 marks.*

Marks

- |   |  |      |
|---|--|------|
| 1 | a) What are the key elements in EIA as per Government of India notification? | (10) |
|   | b) Discuss the need and importance of EIA                                    | (5)  |
| 2 | a) Identify and list the major primary and secondary air pollutants          | (5)  |
|   | b) Discuss the phenomena of photochemical smog.                              | (5)  |
|   | c) What are the human health effects of carbon monoxide as an air pollutant? | (5)  |
| 3 | a) Distinguish point and non-point sources of water pollution with examples  | (10) |
|   | b) Discuss the significance of public participation in EIA                   | (5)  |

**PART B***Answer any two full questions, each carries 15 marks.*

- |   |   |      |
|---|---|------|
| 4 | a) Discuss the disposal and management practises adopted for e-wastes                   | (10) |
|   | b) What are the major effects of pesticide pollution?                                   | (5)  |
| 5 | a) Define impact. Give a detailed classification for the different impacts              | (10) |
|   | b) Discuss the effect of development on agriculture.                                    | (5)  |
| 6 | a) Discuss the various factors leading to ozone layer depletion and how it is measured. | (10) |
|   | b) Discuss the various characteristics of solid wastes.                                 | (5)  |

**PART C***Answer any two full questions, each carries 20 marks.*

- |   |   |      |
|---|---|------|
| 7 | a) Explain in detail, different types of impact assessment methodologies      | (10) |
|   | b) Discuss how you will prepare an EIA for a national highway                 | (10) |
| 8 | a) Give the salient features of air quality standards                         | (10) |
|   | b) Discuss the limits of noise level in different areas of community          | (5)  |
|   | c) What you meant by environmental management plan?                           | (5)  |
| 9 | a) Explain the socio economic impacts usually encountered due to development. | (10) |
|   | b) Discuss the role of an environmental engineering in context with EIA?      | (10) |

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