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**CE-7004 (1) (CBGS)****B.E. VII Semester**

Examination, November 2018

**Choice Based Grading System (CBGS)****Pavement Design***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Answer any five questions. Answer two parts in each question.  
 ii) All questions carry equal marks.  
 iii) Solve all parts of any question in continuous at the same place. <https://www.rgpvonline.com>

1. a) Define ESWL and Write any five points indicating the significance of ESWL in pavement design. 7  
 b) Briefly explain the concept of vehicle damage factor and write down the expression for calculating equivalency factor for Tandem and tridem axles. 7  
 c) Determine the cumulative standard axle load repetitions as per the IRC recommendations for the 2-lane divided carriageway having a lane distribution factor of 50%, handling a total traffic of 6000 vehicles per day in which share of commercial traffic is 55%. The effect of overloading is 5 and annual traffic growth rate is 7.5% for 15 years. <https://www.rgpvonline.com> 7
2. a) Enlist various methods for the design of flexible pavements. Briefly explain the governing factors that influence the design of flexible pavements. 7

- b) Draw a flow chart indicating the detailed process of mechanistic empirical design of pavement in detail. 7
- c) Briefly explain fatigue and rutting philosophy in the analysis of pavement layers with a neat sketch and Write down the expressions for calculating the load repetitions due to rutting and fatigue. <https://www.rgpvonline.com> 7

3. a) Define Radius of relative stiffness. Estimate the radius of relative stiffness if the thickness of the pavement is 500mm and thickness of slab is 300mm. The elastic modulus of cement concrete is 30,000 MPa and Poisson's ratio of concrete is 0.15 and modulus of subgrade reaction is 60 MPa/m and effective modulus of subgrade reaction is 300MPa/m. 7  
 b) Explain various stresses and strains induced in flexible and rigid pavements. Draw neat sketches indicating critical locations of strains and stresses in both the pavements. 7  
 c) Briefly explain the concept of top down cracking and bottom up cracking in the rigid pavement with a neat sketch. <https://www.rgpvonline.com> 7
4. a) List out various governing factors to be considered in the design of rigid pavement. Write down the significance of providing the drainage layer in rigid pavement. 7  
 b) Explain the procedure for the design rigid pavement being adopted as per IRC standards. 7  
 c) Briefly explain the fundamental concepts of Westergaard's theory for the design of rigid pavement. 7

46

5. a) List out various strengthening practices being adopted for flexible and rigid pavement. 7
  - b) Elaborate structural evaluation and functional evaluation in flexible and rigid pavement. 7
  - c) Classify various types of investigations required to carry out for functional and structural evaluation of flexible and rigid pavement. <https://www.rgpvonline.com> 7
6. a) Briefly explain the functional and structural behavior of bituminous bound layers and bituminous surface layers in flexible pavement. 7
  - b) Classify various fundamental theories being adopted in design and analysis of flexible pavements. Elaborate the concept of visco-elastic theory. 7
  - c) A circular load having radius 152mm and uniform pressure 552 kPa is applied on a two-layer system. The subgrade has CBR value of 4% and can support a maximum vertical stress of 55kPa. If the Bituminous layer has elastic modulus 3.45 GPa, what is the required thickness of a full-depth pavement? If a thin surface treatment is applied on a granular base with elastic modulus 173MPa, what is the thickness of base course required? Also estimate the allowable number of load repetitions. 7  
<https://www.rgpvonline.com>
7. a) Briefly explain the concept of Fatigue analysis in the design of rigid pavement. 7
  - b) Briefly explain the procedure for the design of transverse joints in seven points. 7

- c) A plate bearing test using a 300mm diameter rigid plate is made on a subgrade. The total load required to cause settling by 5.08 mm is 47.15kN. After 254mm of gravel base course is placed on the subgrade, a plate bearing test is made on the top of the base course. The total load required to cause settling by 5.08 mm is 94.3023kN. Assuming a Poisson ratio of 0.5, determine the thickness of base course required to sustain a 222.411 kN tire exerting a contact pressure of 689 kPa over a circular area, yet maintain a deflection of not more than 5.08mm. <https://www.rgpvonline.com> 7
8. a) Draw a flow chart indicating the detailed procedure to be adopted for the structural evaluation of Flexible pavement using Benkelman Beam deflection technique. 7
  - b) Write a short notes on 7
    - i) Boussinesq's theory
    - ii) Burmister layer theory

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