Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: CRASHWORTHINESS AND OCCUPANT SAFETY

[AAE 5234]

REVISED CREDIT SYSTEM
(25/04/2018)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data may be suitable assumed.

1A. Mention the requirements for crashworthiness. **(03)**

1B. Discuss the crash approach using lumped Mass spring model by illustrating the condition of front impact. **(05)**

1C. Sketch the block diagram to show the design elements for crash energy management with the case of compartment structure. **(02)**

2A. Explain the design features of elastic plastic beam with plastic hinge model under collapsible beam. **(03)**

2B. Sketch the moment rotation characteristics graph for thin walled beam. **(02)**

2C. For thin-walled sections of t/b =0.06, β = 1, find the max load carrying capacity for a square steel column (α = 1, k_p = 2.11, v = 0.3 and E =30x10^6 psi). Consider yield strength of the material as 248 Mpa. Discuss Federal Motor Vehicle Safety (FMVSS 214) test standard **(05)**

3A. Mention the assumptions used for thin shell theory. **(02)**

3B. Contrast the differences between implicit analysis and explicit analysis. **(03)**

3C. Obtain the finite element formulation of a degenerated shell. **(05)**

4A. Mention the postulates which are applicable to study the crash circumstance. **(03)**

4B. List the requirements of FMVSS 208 and explain any one. **(02)**

4C. Explain the situation of occupant response with the help of Velocity time plots during braking for unrestrained and restrained condition. **(05)**

5A. Explain the modeling methodology for anthropomorphic subjects to simulate **(03)**

real human body.

5B. Compare multi body models to finite element models. **(03)**

5C. Discuss the Kinematics of a Pair of Bodies Connected by a Joint with a example. **(04)**