Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

I SEMESTER M.TECH. (Structures.) MAKE-UP EXAMINATIONS

SUBJECT: ADVANCED MECHANICS OF SOLIDS
[CIE 5126]

Date of Exam: Time of Exam: Max. Marks: **50**

Instructions to Candidates:
- ❖ Answer all the questions.
- ❖ Any missing data may be suitably assumed.

Q. No.	Questions	Marks	CO	BL
1A.	The state of stress at a point is given below, $[s] = \begin{bmatrix} 60 & -30 & 20 \\ -30 & 50 & 15 \\ 20 & 15 & -18 \end{bmatrix}$ Evaluate the principal stresses and the direction of major principal stress plane only.	**5**	**1**	**5**
1B.	The displacement field is given as, $U = (3x^3 + 2y)i + (2y + 6z)\,j + (5x^2 + 6y)k$ Evaluate the principal strains at (-6, 9, –1) and the direction of the major principal strains.	**5**	**2**	**4**
2A.	Analyze a simply supported beam for bending stresses using the Airy's stress function. The beam is of length '2L', unit width and depth '2H' subjected to a concentrated force 'P' at the mid span.	**5**	**2**	**4**
2B.	Illustrate the method to obtain equilibrium equations in Polar co-ordinate system corresponding to moments only ($\Sigma M_o = 0$) for a general 2D circular element of unit thickness.	**5**	**3**	**4**
3A.	Illustrate the method to obtain the strain displacement relations in polar coordinate system corresponding to radial direction only.	**5**	**3**	**4**
3B.	Illustrate the method to obtain equilibrium equations in Polar co-ordinate system corresponding to 'radial direction only' for a general 3D circular element of thickness 'dz'.	**5**	**3**	**4**
4A.	With the usual notations illustrate the Navier's solution technique to obtain the expression for q_{mn} of the plate for a simply supported rectangular plate of dimension a×b with thickness 't' subjected to patch load of intensity 'q_o' kN/m^2 distributed over a dimension u×v.	**5**	**4**	**4**
4B.	Illustrate the method to obtain the equilibrium equations corresponding to moment ($\Sigma Mx = 0$) for a rectangular thin plate of size '$d_x \times d_y \times t$' subjected to a transverse load q (x,y).	**5**	**4**	**4**
5A.	With the usual notations using bending theory illustrate the method to obtain equilibrium equations for shells corresponding to the circumferential axis ($\Sigma F\theta = 0$).	**5**	**5**	**4**
5B.	Outline the characteristics of various types of shells.	**3**	**5**	**4**
5C.	Illustrate the method for obtaining the governing PDE of plates by using moment curvature relations.	**2**	**4**	**4**