

**CODE NO:- K-8012**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**M.E.(Mechanical) Examination Nov/Dec 2015**  
**Advanced Machine Design**  
**(Revised)**

[Time: Three Hours]

[Max. Marks: 80]

“Please check whether you have got the right question paper.”

N.B

- i) All questions are compulsory.
- ii) Use separate answer book for each section
- iii) figure to the right indicate full marks
- iv) Use of non-programmable calculator is allowed.
- v) Assume suitable data, if necessary and state it clearly.

Section A

- Q1. Attempt any two: 16
- a) Explain Mohr's circle for tri-axial state stresses
  - b) Derive the expression for the axial deflection of ring spring when loaded by axial compressive force 'P'
  - c) Which standard curves are used for displacement pattern of cams? Compare those curves stating their merits and demerits
- Q.2 Explain principle strains due to perpendicular stresses and shear stresses. 12
- OR**
- How principle stresses are computed from principle strains? 12
- Q.3 A) State characteristics and merits of Belleville spring and also its applications 06
- B) A steel Belleville spring has the ratio of  $h/t=1.5$  and the ratio of maximum diameter to minimum diameter is 2. The thickness of disc is 6.5mm. The stress induced in the spring material is 1200 Mpa. When it is compressed flat, find the load P and minimum and maximum radii. Find the maximum possible stress the spring can sustain corresponding load P. 06
- OR**
- What are the advantages and disadvantages of square section helical compression spring, ring spring Belleville spring and Torsion bar spring over Round bar spring? 12
- Q.4 Attempt any two: 16
- a) Explain creep mechanism
  - b) Explain basic advantages of analysis software
  - c) Explain the design of belts through interactive programming
  - d) Explain cone or flat disc spring theory

Q.5 Explain the term 'Polynomial Cam' Derive an equation for 3-4-5 polynomial (D-R-D) Cam and show that it gives the best results. 12

**OR**

A cam rotates at 300 rpm and has total lift of 50 mm with Dwell-Rise-Dwell type motion. Find the displacement, velocity and acceleration after  $30^\circ$  of cam rotation, if the motion of follower is SHM. 12

Q.6 a) What is fracture? Explain the effect of temperature & stress on creep? 06

b) Creep test on a stainless steel at  $550^\circ\text{C}$  produced a strain of 0.12 after 300 hours when subjected to stress of 350 Mpa and strain of 0.08 after 245 Mpa. Assuming steady state creep, calculate the time to produce 0.1 percent strain in a link bar of the same material when stressed to 75 Mpa. 06

**OR**

Write short notes on any two of the following 12

- a) Causes and interpretation of failures
- b) Fracture mechanics approach to design
- c) Effect of the pressure angle in cam design.