

**SUBJECT CODE NO:- P-8146**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**M.E. (Mechanical) Examination May/June 2017**  
**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) Figures to the right indicate full marks.
  - iv) Use of non-programmable calculator is allowed.
  - v) Assume suitable data, if necessary and state them clearly.

Section A

- Q.1 Attempt any two: 16
- a) Explain tri-axial state of stresses.
  - b) Derive the expression for the axial deflection of ring spring when loaded by axial compressive force 'P'.
  - c) Explain the volumetric strains and bulk modulus.
- Q.2 A) What is the effect of the pressure angle in the cam design. 06  
 B) Define ramp height of polydyne cam? Derive an equation for ramp height from basic relationship of polydyne cam. 06
- Q.3 Explain principal strains due to perpendicular stresses and shear stresses. 12
- OR
- a) What are the advantages and applications of a square section helical compression spring? 04
  - b) An element has a tensile stress of  $600 \text{ N/mm}^2$  and a compressive stress of  $400 \text{ N/mm}^2$  acting on two mutually perpendicular planes and two equal shear stresses of  $100 \text{ N/mm}^2$  on these planes. Find the principal stress and maximum shear stress. 08

Section B

- Q.4 Attempt any two:- 16
- a) Explain rupture theory.
  - b) Explain the philosophy of computer aided machine design.
  - c) Explain the design of spur gear through interactive programming.
- Q.5 If the equation for polynomial cam is  $y = C_0 + C_1x + C_2x^2 + C_3x^3 + C_4x^4 + C_5x^5$  12  
 Find the values of constants for the boundary condition.  
 When  $x=0, y=h, y'=0$   
 When  $x=1, y=y'=y''=y'''=0$   
 Compute and plot values of  $y/h, y'/h, y''/h$  and  $y'''/h$  at intervals of  $x=0.2$
- OR
- A cam rotates at 300 rpm and has total lift of 50mm 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 under cutting of a cam? Explain how it can be avoided. 06  
 b) A steel plate with a through crack length  $2a=24\text{mm}$  is subjected to stress of  $425 \text{ N/mm}^2$  normal to crack. If the yield strength of the steel is  $160 \text{ N/mm}^2$ , what is the plastic zone size and stress intensity factor for the crack? Assume that the plate infinitely wide. 06
- OR
- a) What are the different methods of obtaining advanced cams? 06
  - b) Explain creep in high temperature low cycle fatigue. 06