

M.Sc.( INSTRUMENTATION ) Examination, 2017

( 1<sup>ST</sup> Year, 2<sup>ND</sup> Semester )

Instrumentation Components Devices

and Power Electronic

PAPER –VI ( T- 201 )

Full marks : 100

Group -A

Time : 4 hrs.

Section – I ( 36 marks )

Question-1 is compulsory and attempt any

two questions from the rest.

( 1 X 10 )

1. (i) Two shafts A and B are made of same materials. The diameter of the shaft A is twice as that of shaft B. The power transmitted by the shaft A will be----- times of shaft B :  
(a) twice      (b) four times      (c) eight times      (d) sixteen times
- (ii) The maximum shear stress theory is used for :  
(a) brittle materials                      (c) ductile materials  
(b) plastic materials                      (d) non-ferrous materials
- (iii) Which of the following loading is considered for the design of axles ?  
(a) bending moment only              (b) twisting moment only  
(c) combined bending moment and torsion  
(d) combined action of bending moment, twisting moment and axial thrust.
- (iv) When helical compression spring is cut into halves the stiffness Of the resulting spring will be :  
(a) Same      (b) double      (c) one-half      (d) one-fourth

- (v) A leaf spring in automobiles is used :
- (a) to apply forces                      (b) to measure forces  
(c) to absorb shocks                      (d) to store strain energy
- (vi) When a helical compression spring is subjected to an axial Compressive load, the stress induced in the wire is :
- (a) Tensile stress                              (c) Compressive stress  
(b) Shear stress                              (d) bending stress
- (vii) The backlash for spur gears depends upon :
- (a) Module                                      (c) tooth profile  
(b) Tooth thickness                              (d) pitch
- (viii) The product of the diametral pitch and circular pitch is Equal to :
- (a) 1      (b)  $1/\pi$       (c)  $\pi$       (d)  $\pi \times \text{No of teeth}$
- (ix) The square threads are usually found on :
- (a) Spindles on bench vice      (c) railway carriage coupling  
(b) Feed mechanism of machine tools      (d) Screw cutting lathe
- (x) The resilience of a bolt may be increase by :
- (a) increasing its shank diameter      (b) increasing its length  
(c) decreasing its shanks diameter      (d) decreasing its length
- (a) What do you understand by steel? How the plane carbon steels are classified depending upon carbon content?      (4) = 5
- (b) Distinguish between plain carbon steel and alloy steel.      (2)
- (c) What is the main difference between brass and bronze ?      (3)
- (d) What is the general effect of adding a small proportion of phosphorus, lead to a bronze.      (3)

3. (a) How are the gears classified and what are the various terms used in spur gear terminology? (6) = 7
- (b) What is the function of a spring? Explain the following term of the spring :
- (i) Free length (ii) solid length (iii) spring rate (iv) stress factor (v) spring index (vi) active and inactive coils. (6)
4. (a) Discuss the advantages offered by the screw joints. (2)
- (b) what are the important terms used in screw threads, explain with neat sketches. (5) = 6
- (c) Explain the method of determining the size of the bolt when the bracket carries an eccentric load acting parallel to the axis of the bolts. (5)
5. (a) Distinguish clearly, giving examples between spindle, axles shaft. (3)
- (b) How the shaft is designed when it is subjected to bending moment only. (5) = 6
- (c) A hollow shaft has greater strength and stiffness than solid shaft of equal weight. Explain. (4)

## Section-II

Answer any two questions

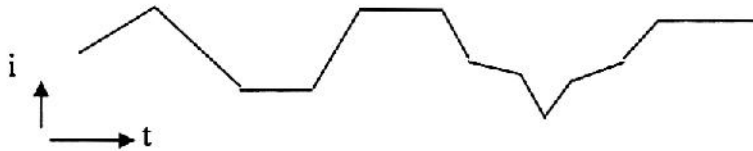
1. Write the name of main components of an absorption instrument UV-Visible radiation. What are the desirable properties of radiation sources for a spectrophotometer? Explain the emission intensity distribution of Halogen & Deuterium Lamp. 3+2+2
2. (a) What is optical filters ? Write the names of different types of optical filters and their applications. 2+2+3
- (b) Write short notes on monochromator. 2+2+3
3. (a) Write names of four types of optical prisms and their application. 2+2+2+1
- (b) What is beam splitters? Write five names of different beam splitters? Write the components used in Laser optics. 2+2+2+1

## Group B

Answer Question no. 1 and any 5 of the remaining questions.

1. Establish the 2<sup>nd</sup> order equation of a LCR circuit under Transient Voltage and from this equation indicate analogous parameters of equation of damped simple harmonic motion with charge, current and voltage. What happens if the resistance is negative? (8+2)

2. If current of



above wave form flows through an Inductor draw the Voltage wave form across the Inductor in same time domain. 8

3. a) What is Current Transformer and Potential Transformer. Why they are used in power and distribution system.

b) A three phase distribution transformer have the following specification

Primary voltage: 11000 Volts, Connection -Delta

Secondary voltage: 433 Volts, Connection -Star

Capacity: 500 KVA, Determine:

i) Primary Line current and phase current.

ii) Secondary phase voltage and line current

4+4=8

4. A 4 stage full wave CW, driven by a 10kHz peak voltage of 15kV, with capacitors value 10nF, and a load current of 2mA.

Find out

a) The no load voltage

b) Voltage drop

c) Output ripple.

What should be the minimum voltage rating of individual diode and capacitor.

5+3=8

5. A 3 stage Marx generator have DC Charging Voltage of 100 KV peak, capacitors of each stage have capacitance of 0.5uF

a) Draw a schematic circuit of Marx Generator

b) What will be the maximum Impulse voltage output.

c) What will be the maximum energy.

4+2+2=8

6. Describe with circuit diagram, the working of a Half-bridge DC to DC converter using transformer along with expression for the average output voltage in terms of input DC voltage, transformer ratio and duty cycle. Justify the use of capacitor in series with transformer primary. 6+2=8

7. a) Describe with schematic circuit a bidirectional speed controller for a DC motor with 4 nos. MOSFET with PWM type switching controller.

b) Design with schematic circuit, series regulators of 9 V and 1A output with short circuit current limiting feature.

5+3=8

8. Draw a schematic circuit for an Uninterrupted Power Supply showing functionality of different section.