# ISRO SAMPLE PAPER JUNE 2005

Written Test for Scientist / Engineer_SC : [ Mechanical Engineering ]

Date: 30-06-2005 , Place: Hyderabad.

Question Pattern for Written Examination

Ø 80 Questions

Ø 2.00 hrs Duration

Ø ¼ Negative Marks

Ø All are Objective & Multiple choice Questions.

1 The concept of ---------- derived from the "ZEROTH LAW OF THERMODYNAMICS".

TEMPERATURE

2 The concept of ---------- derived from the "SECOND LAW OF THERMODYNAMICS".

ENTROPY

3 The expression for isentropic index [γ] in terms of number of degrees of freedom

( n ) ----------

1+ [ 2 / n]

4 The critical Reynolds no upto which the viscous flow exists in pipe ----------

2000

5 Two forces of equal magnitude P acts at right angles to each other and having same directions. Find out the expression for their resultant [R ]----------

[2]½ P

6 The angular frequency of handclock----------

Π/30 rad/s

7 The equation for free torsional vibration----------

[1/2Π] [q/I]½

8 A thin cylinder is subjected to longitudinal stress σ0 and internal pressure P , findout the maximum shearstress developed in it [ q max] ----------

0.5 σ0

9 Rate of moment of momentum is equal to the ----------

Torque applied by the body

10 The expression for loss of energy [he ] due to sudden enlargement of the pipe--------

he =[v1-v2]²/2g

11 A spring of stiffness K is divided into “n” number of springs. Each spring having stiffness ----------

nK

12 The non-dimensional number corresponds to

[inertia force\compressibility force]½---------- Euler number

13 Equation for forced vortex flow----------

v/r = constant

14 The causes of cavitation

Metallic surfaces are damaged

Noise & vibrations

15 How to increase the thermal efficiency in Carnot cycle by----------

Decreasing low temperature

16 The slenderness ratio in columns can be obtained from the ----------

Least radius of gyration

17 50:1 gear reduction ratio possible in----------

worm gear

18 Wire drawing property named as ----------

ductility

19 One man is standing in the elevator and the elevator is moving in the upward direction. What type of reading regarding the weight of man will we get from gauge----------

The weight of man shown by the gauge will more the actual weight of the man.

20 LMTD for counterflow heat exchanger is compared to parallel to heat exchanger-----

More

21 The free damping equation $2y^{oo} + 3y^{o} + 8y = 0$. Calculate damping factor (D.F )--------

3/8

22 The discharges for the two parallel pipes of same lengths are Q1 & Q2 respectively and their diameters are 200 mm & 800 mm respectively. Calculate the ratio of discharge of smaller pipe to larger pipe.

1/32

23 A compressor is used to compress the air from 5 bar to 10 bar .Calculate its critical pressure [ $P*$]----------

2.64 bar

24 Equivalent twisting moment----------

$$Te = [T^2 + M^2]^{1/2}$$

25 The shear stress distribution in pipe flow ----------

Centre is zero and linearly varying from the center to the wall

26 The irrational component in x-y is----------

$$\delta v/\delta x = \delta u/\delta y$$

27 The ratio kinetic viscosity/thermal diffusivity is ----------

Nusselt Number

28 The cylinder is subjected to insulations K & 2K at the outside surface to avoid heat transfer. In order to arrest heat transfer effectively , which insulation should be provided first at the outer surface?

2K & K respectively

29 The wall having conductivities

K1 K2

Findout the equivalent conductivity of the material----------?

29 The maximum amplitude in this vibration equation y = 6 sinωt --------

6

30 The thermal boundary layer in an ideal fluid flow is ----------

0

31 What does tend to stagnation point ----------

The velocity is 0 at the stagnation point due to the increase in pressure energy from the conversion of K.E into P.E.

32 Match the following:

i. subsonic nozzle : figure

ii. Supersonic nozzle : figure

iii. Subsonic diffuser : figure

iv. Centrifugal compressor : figure

33 The factor of safety subjected to number of cycles related to

Endurance limit

34 In composite beam , width is directly proportional to ----------

if the depth of the beam is kept constant.

α M

35 The heat transfer rate of hollow cylinder is inversly proportional to the following

---------- r2/r1

36 A material at 300ºC is immersed in water at 30ºC such that it will take 170 seconds to become 150ºC .

A same material at 300ºC is put in air at 30ºC but it will take 200 seconds to become 150ºC. What is the reason behind it ?

K of water is more compared to air

37 Radiation is ---------- wave phenomenon

Electromagnetic without medium

38 The compression ratio[r] of petrol engine ranges from ----------

6 to 10

39 $\int \delta Q/T = 0$ and $\Delta s = 0$ corresponds to ---- irreversible & adiabatic

40 Cold working of metal increases ----------

Tensile strength

41 The power absorbed in belt drive depends on----------

Tension in tight side, Tension in slack side, coefficient of friction & Radius of pulley.

42 The temperature loss related ---------- hysteresis loss

43 The convergent pipe having entry and exit diameters are 100 and 50 mm respectively, find out their velocity ratio from entry to exit……..

1/4

44 They had given one composite circular pipe having 4 varying cross sections . They are 2D, 1.5D, 4D & D respectively. The water is entering at velocity V at section 1 and leaving at section 4. Find out the pressure decreasing order……

P4>P2>P1>P3

45 The bulb having weight 150N supported by two ropes and attached to the walls having angles 45º & 60º. Findout the reaction forces in the ropes ?

This is related to Lamis theorem

46 A hollow sphere of radius r . A particle is moving with coefficient of friction 1/[3]½ inside the sphere from wall . which height will it become rest?

47 The disc is resting on the rough wall by a rope tied at the center . The rope makes angle with the wall around 30º. The tension in the string is ----------than the weight of the disc.
more

48 A railway wagon containing partially full of water. Which angle----------

49 Findout the graph between discharge [Q] in the x-axis and head [H] in the y-axis----------

50 In welding pitch dimension is limited to----------

51 The composition of inconel alloy----------

52 There is a heat transfer between two walls having thickness and conductivities k1 & K2 respectively. The linear temperature profile of first wall is more steeper than the second wall . Findout the ratio K1/K2 ----------

a) >0 b) <0 c)=0 d) the given data is insufficient

53 The max shear stress developed in solid circular shaet is 100 MPa . Calculate the max normal stress developed in it? ??????

54 This question related to welding ----------

55 Bearing liner----------

a) Babbit metal b) Gun metal

56 Electrical resistance material ----------Nichrome

57 This question related to radiation

58 A sun emits 1150K at 0.5µ. A furnace emits 300k from small door ----------

59 In the simple pendulum , the maximum amplitude depends on ---------- increase in length

60 The fuel flow increases if----------

a) exhaust valve burnt b) filter choke c) silencer choke

61 The jet propulsion depends on----------

a) jet velocity b) weight ratio

62 What is the condition for perfect frame----------

63 Depth of cut can be increased by----------

64 The workpiece can be held in----------

65 This is related toNucleate boiling

66 What is the expression for Reynolds number in terms of diameter of the pipe……..Re =ρVD/ μ

67 Air conditioning means----------

a) cooling & heating b)dehumidifying c) removing impurities from air d)all

68 Fibrous fracture occurs in ----------

a)brittle fracture b) ductile fracture c)shear fracture d)none

69 In laser beam machining , the workpiece should be----------

a)absorbed by all the rays b) reflected by all the rays

70 Foam and coke are good insulators. Why?----------

a)less density b)

71 Gold property----------

a)good conductor b)good insulator

72 In lathe , the workpiece can be held in ----------

a) live center b)steady rest c)3-way chuck d)4-way chuck

INTERVIEW PATTERN

I. Project Explanation

II. Fluid Mechanics:

i. Define laminar flow & Turbulent flow

ii. What is the value of Reynolds no in pipe flow

iii. What is the significance of Reynolds no

iv. Head losses in pipe

v. Define boundary layer in pipe flow & thickness of boundary layer

vi. What is the variation of $\delta$ in laminar & turbulent flow

III. Strength of materials

i. Draw the figure for spring damper system

ii. Differential equation for spring damper system

iii. Find out the deflection of spring damper system

iv. Define stiffness and unit of stiffness

IV. Material Science

i. Ferrous materials

ii. Non-ferrous materials

iii. Define fatigue

iv. Define fatigue resistance?

v. Curve for fatigue

vi. Fatigue limit