M/P ENT - 25

Total No. of Pages : 12

Seat No.	

M.Phil./Ph.D. Entrance Examination, September - 2019
MECHANICAL ENGINEERING

Day and Date : Thursday, 19 - 09 - 2019 **Total Marks : 100**

Time : 4.00 p.m. to 6.00 p.m.

Instructions :

1) **All questions are compulsory.**
2) **Each question carries 2 marks.**
3) **Answers should be marked in the given OMR answer sheet by darkening the appropriate option.**
4) **Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR Answer Sheet.**
5) **Follow the instructions given on OMR Sheet.**
6) **Rough work shall be done on the sheet provided at the end of question paper.**
7) **Only non programmable calculators are allowed.**

1) To apply for a patent the inventor must

   A) State the date on which the invention was first reduced to practice

   B) Demonstrate that their invention works

   C) File an application at a patent office which must comply with formal and technical requirements

   D) Draft the full specification of the patent they seek, which cannot be later amended

2) Fundamental research is mainly concerned with

   A) Generalizations and formulation of a theory

   B) Finding solution for an immediate problem

   C) Both A and B

   D) None of these

P.T.O.

3) Intellectual Property Rights (IPR) protect the use of information and ideas that are of

A) Ethical value
B) Commercial value
C) Social Value
D) Moral Value

4) Idea generation by two or more people thinking as freely as possible is formally known as:

A) Gap analysis
B) Learning curve
C) Brain storming
D) None of these

5) Literature review is not usually concerned with

A) Literary appreciation
B) Objective setting
C) Research instrument design
D) Subsequent data collection

6) What is a research design?

A) A way of conducting research that is not grounded in theory
B) The choice between using qualitative or quantitative methods
C) The style in which you present your research findings, e.g. a graph
D) A framework for every stage of the collection and analysis of data

7) Which one of the following is a data collection method?

A) Positivism
B) Interview
C) Case study
D) None of these

8) Which one of these is not normally associated with quantitative data?

A) Analysis guided by standardized rules

B) Analysis of collected data

C) Numbers

D) Researchers views of high importance

9) Which research strategy is described here?

The introduction of planned change on one or more of the variables; measurement on a small number of variables and control of other variables.

A) Experiment

B) Ethnography

C) Survey

D) Case study

10) Which of the following is a criterion for a good research question?

A) Questions should be long and use complex terms

B) Questions should show where my research biases are

C) Questions should connect with established theory and research

D) Questions should sound contemporary

11) Which one of the following is an example of processed data?

A) CCTV recordings of shopper visits

B) Tables from surveys

C) Customer comments

D) Number of visitors to a restaurant

12) What are secondary data?

A) Existing data
B) Ordinary data
C) Unimportant data
D) None of these

13) Which one of these is not a way of measuring central tendency?

A) Measuring the value that occurs most frequently
B) Regression analysis
C) Measuring the middle value after the data have been ranked
D) Mean

14) Parametric and non-parametric are

A) General tests of statistical relevance
B) Terms used in medical practice
C) Alternatives to standard deviation tests
D) Two main groups of statistical significance tests

15) Testing the probability of a relationship between variables occurring by chance alone if there really was no difference in the population from which that sample was drawn is known as

A) Multiple regression analysis
B) Chi-squared tests
C) Significance testing
D) Correlation coefficients

16) ANOVA is

A) the name of a statistical software package
B) a government body which collects social statistics
C) a one-way analysis of variance
D) none of these

17) A pictogram is

A) a photograph

B) a line drawing

C) a way of measuring the impact of data presentation techniques

D) an illustration where each bar is replaced by a picture or series of pictures chosen to represent the data

18) Accepting a null hypothesis when it is false is called as

A) Type I error
B) Type II error
C) Type III error
D) None of these

19) The simple correlation coefficient takes values between

A) –1 and +1
B) 0 and –1
C) 0 and 1
D) None of these

20) In a factorial design with two independent variables, one having two categories and second having three categories, the total number of interactions are

A) 2
B) 4
C) 3
D) 6

21) A Hypothesis which develops while planning the research is

A) Null Hypothesis
B) Working Hypothesis
C) Descriptive Hypothesis
D) Relational Hypothesis

22) Sampling which provides for a known non zero chance of selection is

A) Probability sampling
B) Analysis
C) Multiple Choice
D) Non-probability sampling

23) The way to systematically solve the research problem is called as

A) Research methodology
B) Technique
C) Research process
D) None of these

24) The journal impact factor depends upon

A) Number of citations
B) Number of publications
C) Both A and B
D) None of the above

25) In case of peer reviewed international journals which of the following is not considered as research publication

A) Research paper
B) Technical brief
C) Design innovation paper
D) Editorial

26) The principal stresses in a plane stress problem are 100 MPa and 50 MPa. The magnitude of the maximum shear stress in MPa will be

A) 25
B) 100
C) 50
D) 150

27) The difference between tensions on the tight and slack sides of a belt drive is 3000 N. If the belt speed is 15 m/s, the power transmitted in kW is

A) 90
B) 45
C) 180
D) 22.5

28) Which one of the following is a criterion in the design of hydrodynamic journal bearings?

A) Rotation factor
B) Yield strength
C) Sommerfeld number
D) Specific dynamic capacity

29) The effective number of lattice points in the unit cell of simple cubic, body centered cubic and face centered cubic space lattices, respectively, are

A) 1,2,4
B) 1,2,2
C) 2,3,4
D) 2,4,4

30) The property by which an amount of energy is absorbed by a material without plastic deformation is called

A) Toughness
B) Ductility
C) Rigidity
D) Resilience

31) A carbon steel having BHN 100 should have ultimate strength in N/mm^2 closer to

A) 100
B) 200
C) 350
D) 500

32) In a coulomb damping by a friction force F on the spring mass system of stiffness k, the reduction in amplitude per cycle is

A) $2F/k$
B) $4F/k$
C) $3F/k$
D) F/k

33) A 10kg mass is supported on a spring of stiffness 4kN/m. The natural frequency of the system in rad/s is

A) 2.5 B) 10

C) 40 D) 20

34) The Reynolds number for flow of a certain fluid in a circular tube is 2500. When the tube diameter is increased by 20% and the fluid velocity is decreased by 40% keeping the fluid same, the Reynolds number in this case is

A) 1800 B) 1200

C) 900 D) 3600

35) The maximum velocity of a one-dimensional incompressible fully developed viscous flow between two fixed parallel plates is 9 m/s. The mean velocity of the flow is

A) 4.5 m/s B) 9 m/s

C) 6 m/s D) 8 m/s

36) The power developed by a four row velocity compounded steam turbine is 6400 kW. The power developed by the last row in kW is

A) 2800 B) 400

C) 2000 D) 1200

37) The work required to compress a gas contained in a cylinder is 5000 kJ. During the process the heat interaction of 2000 kJ causes the surrounding to be heated. The change in internal energy of the gas during the process in kJ is

A) 7000 B) –3000

C) –7000 D) 3000

38) As the thickness of insulation around a circular pipe increases the heat loss to surrounding due to

A) Convection increases and conduction decreases

B) Convection decreases and conduction increases

C) Convection and conduction increases

D) Convection and conduction decreases

39) Heat is lost from a 100 mm diameter steam pipe placed horizontally in a surrounding at 30°C. If Nusselt number is 25 and thermal conductivity of air is 0.03 W/m-K. The heat transfer coefficient in W/m^2-K shall be

A) 6.5 B) 25

C) 7.5 D) 30

40) If T is the temperature corresponding to optimum wavelength then according to Wein's displacement law, the maximum monochromatic emissive power is proportional to

A) T^5 B) T

C) T^3 D) T^4

41) In a counter flow heat exchanger the product of specific heat and mass flow rate is same for the hot and cold fluids. If NTU is equal to 0.5 then the effectiveness of the heat exchanger is

A) 1 B) 2

C) 0.33 D) 0.55

42) In condenser of a steam power plant the steam condenses at a temperature of 60°C. The cooling water enters at 30°C and leaves at 45°C. The logarithmic mean temperature difference of the condenser is

A) 16.5°C
B) 12.6°C
C) 15.5°C
D) 21.6°C

43) A steel bar 200 mm in diameter is turned at a feed rate of 0.25 mm/rev with a depth of cut of 4 mm. The rotational speed of the work piece is 160 rpm. The material removal rate in mm^3/sec is

A) 1675.5
B) 1575.5
C) 1700
D) 1625

44) In a machining operation, doubling the cutting speed reduces the tool life to 1/8th of the original value. The exponent n in Taylor's tool life equation $VT^n = C$ is

A) 1/2
B) 1/8
C) 1/4
D) 1/3

45) The roll separating force in rolling process can be reduced by

A) Increasing roll diameter
B) Reducing roll diameter
C) Deploying backing rolls
D) Reducing coefficient of friction

46) The true strain for a low carbon steel bar which is doubled in length by forging is

A) 0.693
B) 0.5
C) 1.0
D) 0.369

47) A mold has a down sprue whose length is 20 cm and cross-sectional area at the base of the down sprue is 1 cm^2. The down sprue feeds a horizontal runner leading to the mold cavity of volume 1000 cm^3. The time required to fill the mold cavity in seconds will be

A) 4.05 B) 6.05

C) 5.05 D) 7.25

48) The solidification time of a cubical casting is related to its side, a, as

A) a B) a^2

C) a^3 D) a^4

49) A standard machine tool and an automatic machine tool are being compared for the production of a component. For standard machine tool: set up time, machining time and machining rate are 30 Min, 22 Min and Rs. 200 per hour respectively. For automatic machine tool: set up time, machining time and machining rate are 2 hours, 5 Min and Rs. 800 per hour respectively. The break-even production batch size above which the automatic machine tool will be economical to use, will be

A) 225 B) 250

C) 200 D) 50

50) In PERT, the span of time between the optimistic and pessimistic time estimates of an activity is

A) σ B) 3σ

C) 12σ D) 6σ

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Rough Work