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प्रश्नपुस्तिका क्रमांक
BOOKLET NO.

प्रश्नपुस्तिका

यंत्र अभियांत्रिकी

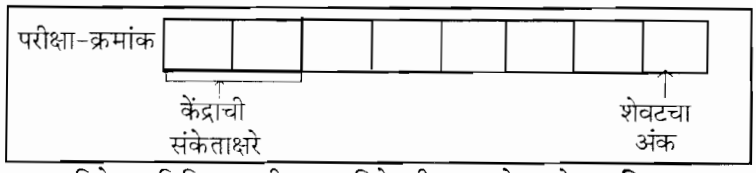
वेळ : $1\frac{1}{2}$ (दीड) तास

एकूण प्रश्न : १५०
एकूण गुण : 300

सूचना

1) सदर प्रश्नपुस्तिकेत १५० अनिवार्य प्रश्न आहेत. उमेदवारांनी प्रश्नांची उत्तरे लिहिण्यास सुरुवात करण्यापूर्वी या प्रश्नपुस्तिकेत सर्व प्रश्न आहेत किंवा नाहीत याची खात्री करून घ्यावी. असा तसेच अन्य काही दोष आढळल्यास ही प्रश्नपुस्तिका समवेक्षकांकडून लगेच बदलून घ्यावी.

2) आपला परीक्षा-क्रमांक ह्या चौकोनात **न विसरता बॉलपेनने** लिहावा.



3) वर छापलेला प्रश्नपुस्तिका क्रमांक तुमच्या उत्तरपत्रिकेवर विशिष्ट जागी उत्तरपत्रिकेवरील सूचनेप्रमाणे **न विसरता नमूद करावा.**

4) (अ) या प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाला 4 पर्यायी उत्तरे सुचविली असून त्यांना 1, 2, 3 आणि 4 असे क्रमांक दिलेले आहेत. त्या चार उत्तरांपैकी सर्वात योग्य उत्तराचा क्रमांक उत्तरपत्रिकेवरील सूचनेप्रमाणे तुमच्या उत्तरपत्रिकेवर नमूद करावा. अशा प्रकारे उत्तरपत्रिकेवर उत्तरक्रमांक नमूद करताना तो संबंधित प्रश्नक्रमांकासमोर छायांकित करून दर्शविला जाईल याची काळजी घ्यावी, **ह्याकरिता फक्त निळ्या वा काळ्या शाईचे बॉलपेन वापरावे, पेन्सिल वा शाईचे पेन वापरू नये.**

(ब) **आयोगाने ज्या विषयासाठी मराठी बरोबर इंग्रजी माध्यम विहित केलेले आहे. त्या विषयाचा प्रत्येक प्रश्न मराठी बरोबर इंग्रजी भाषेत देखील छापण्यात येईल. त्यामधील इंग्रजीतील किंवा मराठीतील प्रश्नामध्ये मुद्रणदोषांमुळे अथवा अन्य कारणांमुळे विसंगती निर्माण झाल्याची शंका आल्यास, उमेदवाराने संबंधित प्रश्न पर्यायी भाषेतील प्रश्नाशी ताडून पहावा.**

5) सर्व प्रश्नांना समान गुण आहेत. यास्तव सर्व प्रश्नांची उत्तरे द्यावीत. घाईमुळे चुका होणार नाहीत याची दक्षता घेऊनच शक्य तितक्या वेगाने प्रश्न सोडवावेत. क्रमाने प्रश्न सोडविणे श्रेयस्कर आहे पण ***एखादा प्रश्न कठीण वाटल्यास त्यावर वेळ न घालविता पुढील प्रश्नाकडे वळावे.*** अशा प्रकारे शेवटच्या प्रश्नापर्यंत पोहोचल्यानंतर वेळ शिल्लक राहिल्यास कठीण म्हणून वगळलेल्या प्रश्नांकडे परतणे सोईस्कर ठरेल.

6) उत्तरपत्रिकेत एकदा नमूद केलेले उत्तर खोडता येणार नाही. नमूद केलेले उत्तर खोडून नव्याने उत्तर दिल्यास ते तपासले जाणार नाही.

7) **प्रस्तुत परीक्षेच्या उत्तरपत्रिकांचे मूल्यांकन करताना उमेदवाराच्या उत्तरपत्रिकेतील योग्य उत्तरांनाच गुण दिले जातील. त्या प्राप्त गुणांतून त्यांनी उत्तरपत्रिकेत चुकीची उत्तरे नमूद केल्याबद्दल गुण वजा केले जाणार नाहीत.**

8) ----------> (कृपया पान उलटवा)

ताकीद

ह्या प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपेपर्यंत ही प्रश्नपुस्तिका आयोगाची मालमत्ता असून ती परीक्षाकक्षात उमेदवाराला परीक्षेसाठी वापरण्यास देण्यात येत आहे. ही वेळ संपेपर्यंत सदर प्रश्नपुस्तिकेची प्रत/प्रती, किंवा सदर प्रश्नपुस्तिकेतील काही आशय कोणत्याही स्वरूपात प्रत्यक्ष वा अप्रत्यक्षपणे कोणत्याही व्यक्तीस पुरविणे, तसेच प्रसिद्ध करणे हा गुन्हा असून अशी कृती करणाऱ्या व्यक्तीवर शासनाने जारी केलेल्य ''परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचा अधिनियम -82'' यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एका वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

तसेच ह्या प्रश्नपत्रिकेसाठी विहित केलेली वेळ संपण्याआधी ही प्रश्नपुस्तिका अनधिकृतपणे बाळगणे हा सुद्धा गुन्हा असून तसे करणारी व्यक्ती आयोगाच्या कर्मचारीवृंदापैकी, तसेच परीक्षेच्या पर्यवेक्षकीयवृंदापैकी असली तरीही अशा व्यक्तीविरूद्ध उक्त अधिनियमानुसार कारवाई करण्यात येईल व दोषी व्यक्ती शिक्षेस पात्र होईल.

8) प्रश्नपुस्तिकेमध्ये विहित केलेल्या विशिष्ट जागीच कच्चे काम (रफ वर्क) करावे. प्रश्नपुस्तिकेव्यतिरिक्त-उत्तरपत्रिकेवर वा इतर कागदावर कच्चे काम केल्यास ते कॉपी करण्याच्या उद्देशाने केले आहे, असे मानले जाईल व त्यानुसार उमेदवारावर शासनाने जारी केलेल्या "परीक्षांमध्ये होणाऱ्या गैरप्रकारांना प्रतिबंध करण्याबाबतचे अधिनियम-82" यातील तरतुदीनुसार कारवाई करण्यात येईल व दोषी व्यक्ती कमाल एका वर्षाच्या कारावासाच्या आणि/किंवा रुपये एक हजार रकमेच्या दंडाच्या शिक्षेस पात्र होईल.

9) सदर प्रश्नपत्रिकेसाठी आयोगाने विहित केलेली वेळ संपल्यानंतर उमेदवाराला ही प्रश्नपुस्तिका स्वत:बरोबर परीक्षाकक्षाबाहेर घेऊन जाण्यास परवानगी आहे. मात्र परीक्षाकक्षाबाहेर जाण्यापूर्वी उमेदवाराने आपली उत्तरपत्रिका समवेक्षकाकडे न विसरता परत करणे आवश्यक आहे.

10) प्रस्तुत प्रश्नपुस्तिकेतील प्रश्नांमध्ये काही दोष आढळल्यास, त्यासंबंधी उमेदवाराने अधिप्रमाणित (Authentic) स्पष्टीकरण/संदर्भ देऊन आपले लेखी निवेदन आयोगाच्या परीक्षा नियंत्रकांकडेच स्वत:च्या तपशीलासह टपालाने पाठवावे. याबाबत पर्यवेक्षक/समवेक्षक इत्यादींकडे विचारणा करू नये. आयोगाकडे सदर परीक्षेच्या दिनांकापासून 8 दिवसांपर्यंत पोहोचलेल्या लेखी निवेदनाची फक्त दखल घेतली जाते. तद्नंतर आलेली निवेदने विचारात घेतली जात नाहीत. तसेच प्राप्त झालेल्या निवेदनाबद्दल कोणताही पत्रव्यवहार केला जात नाही.

नमुना प्रश्न

प्र.क्रं.201 : What is the minimum number of pairs required to form a Kinetmatic chain ?

(1) Two (2) Three
(3) Six (4) Four

ह्या प्रश्नाचे योग्य उत्तर "(3) Six' असे आहे. त्यामुळे या प्रश्नाचे उत्तर "(3)" होईल. यास्तव खालीलप्रमाणे प्र. क्र. 201 समोरील उत्तर क्रमांक "[3]" हा कंस पूर्णपणे छायांकित करून दाखविणे आवश्यक आहे.

प्र. 201. [1] [2] ■ [4]

अशा पद्धतीने प्रस्तुत प्रश्नपुस्तिकेतील प्रत्येक प्रश्नाचा तुमचा उत्तरक्रमांक हा तुम्हाला स्वतंत्ररीत्या पुरविलेल्या उत्तरपत्रिकेवरील त्या त्या प्रश्नक्रमांकासमोरील संबंधित कंस पूर्णपणे छायांकित करून दाखवावा. **हयाकरिता फक्त निळ्या वा काळ्या शाईचे बॉलपेन वापरावे. पेन्सिल वा शोईचें पैन वापरू नये.**

पर्यवेक्षकांच्या सूचनेविना हे पृष्ठ उलटू नये

कच्च्या कामासाठी जागा
SPACE FOR ROUGH WORK

MECHANICAL ENGINEERING

1. In multistage compression, intercooling is done to
   (1) reduce the volume of air
   (2) minimise the work of compression
   (3) cool the air
   (4) all of the above

2. Refrigeration is based on
   (1) First Law of Thermodynamics
   (2) Second Law of Thermodynamics
   (3) Dalton's law
   (4) Boyle's law

3. In domestic refrigerator, following compressor is used
   (1) Rotary (2) Reciprocating
   (3) Centrifugal (4) None of the above

4. Freezing point of Brine is
   (1) below 0° centigrade
   (2) above 0°centigrade
   (3) equal to 0° centigrade
   (4) none of the above

5. Function of thermostat in a domestic refrigerator is to maintain
   (1) Temperature constant
   (2) Pressure constant
   (3) Volume constant
   (4) None of the above

6. Air conditioning is control of
   (1) temperature of air
   (2) relative humidity of air
   (3) temperature, relative humidity and motion of air
   (4) none of the above

7. In comfort air-conditioning, the required comfort conditions are
   (1) 15 °C DBT & 75 % R.H.
   (2) 20 °C DBT & 80 % R.H.
   (3) 15 °C DBT & 35 % R.H.
   (4) 24 °C DBT & 60 % R.H.

8. Human body dissipates heat in the form of
   (1) sensible heat only
   (2) latent heat only
   (3) both sensitive and latent heat
   (4) none of the above

9. The method commonly used for dehumidifying air is
   (1) heating (2) cooling
   (3) heating and cooling (4) to spray steam in the air

10. Refrigerant used in vapour absorption refrigerator is
   (1) Freon-12 (2) water
   (3) ammonia (4) F-11

11. If window air conditioner is kept at the centre of closed room, then temperature of the room will
   (1) increase (2) decrease
   (3) not change (4) unpredictable

12. In value engineering, the term value refers to _____.
   (1) manufacturing cost of the product
   (2) selling price of the product
   (3) total cost of the product
   (4) utility of the product

13. String diagram is used to _____.
   (1) know the floor space dimensions of a factory
   (2) measure paths of workers/materials/equipments
   (3) measure paths of workers/materials/equipments and their machinery
   (4) trace paths of workers/materials/equipments

14. In a three high rolling mill, the middle roll rotates in a direction _____ to those of the upper and lower rolls.
   (1) same as (2) opposite as
   (3) same or opposite (4) perpendicular

15. Which of the following is not a locating device ?
   (1) Support pin (2) Trunnion
   (3) Centraliser (4) Cylindrical locator

16. Therbligs refer to the _____.
   (1) activities performed to complete the work in least time
   (2) motions of human body at work place
   (3) recording of the flow of the work
   (4) activities performed to analyse human motions

17. The vector sum of cutting velocity and chip velocity is _____ shear velocity.
(1) equal to (2) more than
(3) less than (4) half of the

18. If 't_o', 't_m' and 't_p' represent optimistic time, most probable time and pessimistic time respectively for a project, then by probability analysis, most probable expected time 't_e' is equal to _____.
(1) $\frac{t_o + 4\,t_m + t_p}{6}$ (2) $\frac{t_o + 6\,t_m + t_p}{6}$
(3) $\frac{t_o + 2\,t_m + t_p}{6}$ (4) $\frac{2\,t_o + 4\,t_m + t_p}{6}$

19. The surface to be left unmachined is marked on the pattern with _____ colour.
(1) red (2) yellow
(3) blue (4) black

20. In ultrasonic machining, the tool is made of _____.
(1) tungsten carbide (2) brass or copper
(3) diamond (4) stainless steel

21. Spacing between two spot welds inspot-welding should not be less than _____, where 'd' is the electrode tip diameter.
(1) d (2) 3 d
(3) 1.5 d (4) 6 d

22. In work measurement (time) study _____.
(1) observed time should be taken as standard time
(2) worker need not be explained reason for study
(3) any worker may be studied
(4) the study should not be conducted without correct tools and materials.

23. Slug pulling during piercing and blanking operations can be avoided by providing _____.
(1) sufficient clearance in holes.
(2) excessive lubrication.
(3) spring loaded punch shedders
(4) perforated punches

24. The rake angle of cutting tool _____.
(1) controls the chip formation
(2) prevents rubbing
(3) determines the profile of the tool
(4) determines whether the cutting action is oblique or orthogonal

25. The normal time is expressed as

(1) $\frac{\text{observed time} \times \text{performance rating (\%)}}{100}$

(2) $\frac{\text{observed time} + \text{performance rating (\%)}}{100}$

(3) $\frac{\text{observed time} - \text{performance rating (\%)}}{100}$

(4) $\frac{\text{observed time}}{\text{performance rating (\%)}} \times 100$

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26. A metal hardened by cold working can be softened by a heat treating process known as

(1) carbonizing (2) process annealing

(3) normalising (4) tempering

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27. Why does a dial gauge need setting when used for linear measurements ?

(1) Dial gauge has a zero centred dial scale, hence requires resetting.

(2) Dial gauge has no reference surface, hence setting provides reference for the measurement.

(3) Dial gauge is sensitive, hence needs resetting all the time

(4) None of the above

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28. The three sigma limits on control chart for X are _____

(1) $\bar{\bar{X}} \pm 3\sigma_{\bar{X}}$ (2) $D_4 R$

(3) $\bar{C} \pm 3\sqrt{\bar{C}}$ (4) $\bar{u} \pm 3\sqrt{u/n}$

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29. Comparators are used for _____

(1) sorting good and incorrect components

(2) measurement in sampling inspection

(3) taking absolute measurement

(4) none of the above

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30. Centring of the manufacturing process (tool setting) is revealed by statistical parameter _____.

(1) standard deviation (2) arithmetic average

(3) skewness (4) range of variation

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31. 'Constant chord' measurement of gears checks _____.

(1) correctness of tooth profile (2) concentricity of gears

(3) pitch circle diameter (4) tooth thickness at chordal addendum

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32. Pneumatic comparators have a very small range of measurement because

(1) it is designed for high magnification

(2) it is highly sensitive

(3) its output has a very short range of linearity

(4) none of the above

33. In foundry, quality control chart used is _____
(1) $\bar{R}$ chart (2) P chart
(3) $\bar{X}$ chart (4) C chart

34. A 0 –25 mm micrometer has smallest main scale division of 0.5 mm and has 50 divisions on thimble. A thimble shows reading of +4 divisions when measuring faces touch each other. This micrometer has read one dimension as 17.28 mm. The correct reading is
(1) 17.24 mm (2) 17.32 mm
(3) 17.26 mm (4) 17.30 mm

35. Flatness of surface plate is assessed using following method or set-up :
(1) Interferometry (2) Tool maker's microscope
(3) Still water micrometer (4) Height Vernier

36. In a sampling plan, number of pieces inspected per lot will be _____ as compared to double sampling and multiple sampling plans.
(1) greater than (2) smaller than
(3) equal (4) none of the above

37. In the inspection by attributes _____.
(1) variation due to assignable factors are determined
(2) good quantities are separated from bad
(3) variations due to chance factors are determined
(4) theory of probability is applicable

38. H_7g_6 (H-seven g-six) gives the following fit :
(1) Interference fit (2) Transition fit
(3) Precision run fit (4) Wide clearance fit

39. Wear allowance is provided on _____.
(1) 'No Go' gauge
(2) Both 'No Go' and 'Go' gauges
(3) 'Go' gauge
(4) Neither 'Go' nor 'No Go' gauge

40. The OC curve is a graph between _____.
(1) percent bad vs. probability of rejection
(2) probability of lot vs. probability of defects
(3) percent defective vs. probability of acceptance
(4) None of the above

41. In alignment test of lathe machine, auto-collimator is used to check _____
(1) true running of spindle
(2) pitch error of lead-screw
(3) carriage movement parallel to spindle axis
(4) flatness of bed

42. If a positive charge 'q' moving with a velocity 'ϑ' through a point in a magnetic field experiences a deflecting force 'F', then the magnetic inductance 'B' at that point will depend on _____.
(1) only 'q' (2) only 'F'
(3) both 'q' and 'F' (4) 'q', 'ϑ' and 'F'

43. A d. c. shunt motor is running at 1000 r.p.m. with no external resistors in its circuit. What may be the place for inserting suitable resistor in order to decrease the speed to 800 r.p.m. ?
(1) across the supply (2) in series with the supply line
(3) in series with armature only (4) in series with field only

44. Dynamometer type instruments are used in the measurement of _____.
(1) D. C. quantity (2) A. C. quantity
(3) Single phase A. C. (4) D. C. or A. C. quantity

45. For a load current of 5A, copper losses in a transformer are 25 watts. If the load current is increased to 10A, the copper losses are _____.
(1) 25 watts (2) 50 watts
(3) 100 watts (4) 12.5 watts

46. An overexcited synchronous motor draws _____.
(1) a lagging current from a.c. source
(2) a leading current from a.c. source
(3) a unity power factor current from a.c. source
(4) a zero current from a.c. source

47. All day efficiency is the performance parameter for
(1) a distribution transformer (2) a power transformer
(3) a pulse transformer (4) all the above transformers

48. A 4 pole, lap wound d.c. generator at a speed of 1000 r.p.m. generates an induced e.m.f. of 250 volts. If the same generator is wave wound and run at 500 r.p.m., the induced e.m.f. of the generator is _____.
(1) 500 volts (2) 1000 volts
(3) 125 volts (4) 250 volts

49. A R-L-C series circuit behaves as a purely resistive circuit at a frequency of 100 Hz. At a frequency of 150 Hz, it will behave as _____.
(1) resistive (2) resistive and inductive
(3) capacitive (4) resistive and capacitive

50. Permeance is a ratio of _____.
(1) $\frac{1}{\text{Resistance}}$ (2) $\frac{1}{\text{Reluctance}}$
(3) $\frac{\text{Resistance}}{\text{Reluctance}}$ (4) $\frac{\text{Reluctance}}{\text{Resistance}}$

51. A d.c. motor draws power from the mains which is essentially controlled by _____.
(1) the load on the motor
(2) the current on full load of the motor
(3) the rated supply voltage
(4) the no-load current of the motor

52. What could be the possible faults if a capacitor-start induction run motor fails to start when switched on to its proper supply ?
(1) open in connection to line
(2) open circuit in motor main
(3) centrifugal switch contacts open
(4) all of (1), (2) and (3) above

53. In a series R-L-C circuit, R = 5 ohms, X_L = 7 ohms. What should be the value of capacitive reactance X_C, so that the power factor of the circuit be 0.707 lag ?
(1) 5 ohms (2) 2 ohms
(3) 7 ohms (4) 12 ohms

54. A three phase delta connected a. c. motor connected to a 3-phase, 400 volts, 50 Hz system is developing 25.6 KW at an efficiency of 80% and a power factor of 0.8. The phase current in the circuit is _____.
(1) $\frac{100}{\sqrt{3}}$ amp (2) $\frac{100}{3}$ amp
(3) 64 amp (4) $100\sqrt{3}$ amp

55. A series R-C circuit with R = 10 KΩ and C = 10 μf is allowed to charge during a pulse width 'T'. For what value of 'T', the waveform across C will show linear characteristic ? Give your choice of correct answer :
(1) T = 5 secs (2) T = 1 sec
(3) T = 0.1 sec (4) T = 0.05 sec

56. A transformer has iron losses of 'p' watts and full load copper losses of '2p' watts. Which of the following statements correctly represent 'total losses' in the transformer at half load ?
(1) 3p watts (2) p watts
(3) $\frac{3p}{4}$ watts (4) $\frac{3p}{2}$ watts

57. In a UJT saw-tooth time base generator, the frequency of oscillation depends upon
(a) emitter resistance
(b) capacitance connected across emitter and base b_2;
(c) Intrinsic stand-off ratio of UJT.
(1) only (a) (2) only (b)
(3) only (c) (4) All (a), (b) and (c)

58. For d.c. calculations of the circuit, a reverse–biased diode appears as _____.
(1) a capacitance (2) an 'ON' switch
(3) a low resistance (4) a high resistance

59. For normal working of a transistor _____.
(a) collector base is reverse biased
(b) Emitter base is forward biased and collector base is reverse biased
(c) Collector base is forward biased, emitter base is forward biased and collector base is reverse biased
(d) emitter base is always reverse biased

Answers
(1) only (d) is true (2) (c) and (d) are true
(3) (b), (c) and (d) are true (4) All four are true

60. Silicon controlled rectifiers are widely used for _____.
(1) amplification of frequency (2) power control
(3) production of oscillations (4) voltage amplification

61. A pure inductor of 0.1 H is carrying a current of 10 sin(2t). What is the voltage drop across the element ?
(1) 1 volt (2) sin(2t) volts
(3) cos(2t) volts (4) 2 cos(2t) volts

62. An output of an LVDT is obtained by connecting the two secondaries _____.
(1) in parallel and in phase opposition
(2) in series and in phase opposition
(3) in series and in same phase condition
(4) in parallel and in same phase condition

63. JFET is _____.
(1) current–sensitive device
(2) voltage–sensitive device
(3) device that has very low input impedance
(4) device that has very low amplification factor

64. Consider the following statements A and R.
Assertion (A) : The resistance of a photoconductive cell increases when illuminated.
Reason (R) : Incident photons of sufficient energy raise valence electrons to conduction band.
Select your answer from the following alternatives :
(1) Both A and R are true and R is the true explanation for A.
(2) Both A and R are true but R is not the true reason for A
(3) A is true but R is false
(4) A is false but R is true

65. This  symbol stands for

(1) Diode (2) Zener diode
(3) Transistor (4) Rectifier

---

66. Ripple factor of a power supply is a measure of
(1) its voltage regulation
(2) purity of its output
(3) its filter efficiency
(4) diode rating

---

67. A resistive load is fed from output of a diode bridge. The load voltage will be closer to d.c. if
(1) series resistor is used
(2) shunt capacitor is used
(3) SCR bridge is used instead of diode bridge
(4) triac is used instead of diode bridge

---

68. A Zener diode works on the principle of _____.
(1) Zener effect
(2) Hall effect
(3) Avalanche effect
(4) both Zener effect and Avalanche effect

---

69. A full wave rectifier with a capacitor filter is used to provide the required d.c. voltage. The rectifier circuit is operated using 230 volts/12–0–12 volts transformer. The no-load output voltage is
(1) 12 volts (2) 16.968 volts
(3) 24 volts (4) 33.936 volts

---

70. Through which terminal of FET, majority charge carriers enter ?
(1) Channel (2) Gate
(3) Source (4) Drain

---

71. The deflection factor "G" is equal to.....where S is the sensitivity of CRO, D is the deflection, E_D is the deflection voltage and L is the length of CRO deflection.
(1) $\frac{1}{S}$ (2) $\frac{1}{D}$
(3) $\frac{1}{E_D}$ (4) $\frac{1}{L}$

---

72. If material expands freely due to heating, it will develop
(1) Thermal stresses (2) Tensile stresses
(3) Compressive stresses (4) No stress

---

73. The total strain energy stored in a body is termed as
(1) Resilience (2) Proof resilience
(3) Modulus of resilience (4) Toughness

---

74. According to Euler's theory, the strength of a column against buckling is dependent upon
(1) Modulus of elasticity (2) Bulk modulus
(3) Cross-section area of column (4) None of the above

---

75. In a beam at a place where the shear force is maximum, the bending moment will be
(1) maximum
(2) minimum
(3) zero
(4) neither maximum nor minimum

---

76. A beam is said to be of uniform strength if
(1) Bending moment is same throughout the beam.
(2) Shear stress is same throughout the beam.
(3) Deflection is same throughout the beam.
(4) Bending stress is same at every section along its longitudinal axis.

---

77. Maximum shear stress in Mohr's circle is
(1) Equal to radius of Mohr's circle
(2) Greater than radius of Mohr's circle
(3) Less than radius of Mohr's circle
(4) None of the above

---

78. The constant term 'a' for Rankine's formula is called Rankine's constant and is given by : where f_c = yield stress in component
E = Modulus of elasticity

(1) $a = \frac{f_c}{\pi^2 E}$ (2) $a = \frac{f_c}{\pi E}$

(3) $a = \frac{f_c^2}{\pi E}$ (4) $a = \frac{f_c \pi^2}{E}$

---

79. What is the angle between plane of maximum shear with principal plane ?
(1) 90° (2) 45°
(3) 60° (4) 0°

80. If a shaft is designed to take combined bending moment (M) and torsion (T), then the equivalent torque will be
(1) $\sqrt{M^2 + T^2}$ (2) $\frac{1}{2}\left[M + \sqrt{M^2 + T^2}\right]$
(3) $\frac{1}{2}\sqrt{M^2 + T^2}$ (4) $M + \sqrt{M^2 + T^2}$

81. Hoop stress σ in a thin cylinder is given by the formula,
where D = Diameter of cylinder, P = Load applied, t = Thickness
(1) $\sigma = \frac{PD}{2t}$ (2) $\sigma = \frac{PD}{4t}$
(3) $\sigma = \frac{PD}{t}$ (4) $\sigma = \frac{PD}{8t}$

82. Working of metals at temperature below their re-crystallisation temperature is defined as
(1) Hot working (2) Cold working
(3) Hot spinning (4) Cold spinning

83. Hollow cylindrical bodies like water pipes, gun barrels etc., can be manufactured by
(1) Investment casting (2) Die casting
(3) Centrifugal casting (4) Shell moulding

84. Split nut in lead screw mechanism of lathe has _____ threads.
(1) Vee (2) Square
(3) Buttress (4) Acme

85. Work holding device used for hollow cylindrical bar on lathe is
(1) Chuck (2) Arbour
(3) Mandrel (4) Magnetic chuck

86. The main difference between a shaper and a planer is
(1) A shaper is smaller in size
(2) A shaper is hydraulically operated while a planer is mechanically operated
(3) Number of cutting tools is more in planer
(4) Cutting tool is stationary in planer while cutting tool moves in shaper

87. Thermo-plastic material such as cellulose nitrate, polystyrene are cast by
(1) continuous casting (2) centrifugal casting
(3) injection moulding (4) die casting

88. Milling of curved irregular surfaces is possible with
(1) shaper (2) vertical column and knee milling machine
(3) plane milling (4) none of the above

89. Shock resisting steel is mainly used for _____ .
(1) leaf and coil spring (2) hammers and chisels
(3) cranks and piston rods (4) loco wheels and rails

90. What are the changes of metal dimensions in hot rolling process as the metal passes through the rolls ?
(1) Reduced in thickness and increased in length
(2) Reduced in thickness and in length
(3) Increased in thickness and reduced in length
(4) Increased in thickness and in length

91. Which process is used to produce tools, gear blanks, crankshafts, connecting rods, gears etc. ?
(1) Forging (2) Smithing
(3) Swaging (4) Fullering

92. Which is the process of removing thick layers of metal by means of Cold Chisel ?
(1) Cutting (2) Sawing
(3) Chipping (4) None of the above

93. Drill size before tapping is derived from the formula _____.
where 'D' is diameter of tap drill size, 'T' is diameter of tap to be used and 'd' is depth of cut
(1) $D = T + 2d$ (2) $D = T - 2d$
(3) $D = T + 3d$ (4) $D = T - 3d$

94. What are conditions which tend to promote the formation of built-up edge of cutting tool ?
(1) Low cutting speed, low rake angle and high speed
(2) High cutting speed, low rake angle and high speed
(3) High cutting speed, high rake angle and high feed
(4) Low cutting speed, high rake angle and low feed

95. Which cutting tool is used for enlarging or finishing a hole previously drilled, bored or cored to give a good finish and an accurate dimension ?
(1) Parallel shank twist drill (2) Taper shank core drill
(3) Reamer (4) Multi-tooth twist cutter

96. Precision grinders are those that finish parts to a very accurate dimensions. One of the grinders is
(1) Swing frame grinder
(2) Abrasive belt grinder
(3) Surface grinder
(4) Portable and flexible shaft grinder

97. Which is a process that is used to produce geometrically true surface, correct minor surface, imperfections, improve dimensional accuracy or provide a very close fit between two contact surfaces ?
(1) Honing (2) Polishing
(3) Lapping (4) Buffing

98. The purpose of annealing is
(1) to refine structure (2) to reduce softness
(3) to improve machinability (4) none of the above

99. Choose the wrong statement from the following :
(1) The shaper in comparison to planer is easier to operate and about three times quicker in action.
(2) In shaper, the metal is removed during forward stroke.
(3) The shaper is best suited for cutting keyways and splines on shafts.
(4) In case of planer, reciprocating motion is given to the cutting tool.

100. The orthogonal cutting takes place when cutting face of tool is at one of the angles mentioned below to the line of action of tool.
(1) 45° (2) 60°
(3) 90° (4) 120°

101. Which one of the following is most suitable to hold the job for drilling hole on the curved surface ?
(1) Angle plate (2) Table with T-slot
(3) Vee-Block (4) None of these

102. A body of weight 1000 N is moved on a horizontal plane having coefficient of friction $\frac{1}{\sqrt{3}}$. The minimum force applied parallel to the horizontal plane to move the body is
(1) $1000\sqrt{3}$ (2) 1000
(3) $\frac{1000}{\sqrt{3}}$ (4) 500

103. The efficiency of screw jack
(1) depends on load on jack
(2) depends on the pitch of the screw threads of the jack
(3) depends on both (1) and (2)
(4) does not depend combinedly on (1) and (2)

104. A dynamometer fitted on internal combustion engine measures the
(1) brake horse power (2) brake torque
(3) indicated horse power (4) indicated torque

105. The size of the cam depends upon
(1) base circle (2) prime circle
(3) pitch circle (4) pitch curve

106. The magnitude of 'Coriolis' component of acceleration of sliding block relative to link is _____.
where v = velocity of sliding block on link
ω = angular velocity of link
(1) $v\omega$ (2) $\frac{v\omega}{2}$
(3) $2v\omega$ (4) $v\omega^2$

107. In an engine mechanism, at what position of crank angle, the angular velocity of connecting rod is zero ?
(1) 180° (2) 90°
(3) 45° (4) 0°

108. Contact ratio of spur gear pair is the ratio of
(a) angle of action to pitch angle
(b) length of line of action to base of pitch of teeth
(c) length of line of action to circular pitch of teeth
(d) arc of contact to circular pitch of teeth
Which of these statements are correct ?
(1) (a), (b) and (c) are correct (2) (a), (b) and (d) are correct
(3) (b), (c) and (d) are correct (4) all are correct

109. The angle between the common tangent to the base circle of gear pair and common tangent to their pitch circle is called as _____
(1) cone angle (2) helix angle
(3) spiral angle (4) pressure angle

110. No force is required for the downward motion of the load on screw jack if _____
(α = pitch angle, ϕ = friction angle)
(1) $\alpha < \phi$ (2) $\alpha > \phi$
(3) $\alpha = 0$ (4) None of the above

111. In case of pivot bearing, the wear is
(1) maximum at the centre of the contact area
(2) zero at the centre of the contact area
(3) uniform throughout the contact area
(4) zero at the maximum radius of the contact area

112. Specific speed of the hydraulic turbine is given by following equation :

(1) $N_S = \frac{N.P}{\sqrt{H}}$ (2) $N_S = \frac{N\sqrt{P}}{H}$

(3) $N_S = \frac{N\sqrt{P}}{H^{3/4}}$ (4) $N_S = \frac{N\sqrt{P}}{H^{5/4}}$

113. Falling drops of rain acquire spherical shape on account of

(1) viscocity (2) surface tension

(3) adhesion and cohesion (4) compressibility

114. The standard atmospheric pressure of air is

(a) 760 mm of mercury

(b) 10.33 metres of water column

(c) 1.0332 atm

(d) 101.325 KN/m^2

(1) (a) alone is correct

(2) (a) and (b) are correct

(3) (a), (b) and (c) are correct

(4) all are correct

115. The centre of gravity of the volume of the liquid dispersed by an immersed body is called as

(1) centre of pressure (2) meta-centre

(3) centre of buoyancy (4) centre of gravity

116. Which of the following represents steady uniform flow ?

(1) Flow through a diverging duct at increasing rate

(2) Flow through a diverging duct at any decreasing rate

(3) Flow through a long pipe at constant rate

(4) Flow through a long pipe at decreasing rate

117. Cavitation in hydraulic turbine results in

(1) noise and vibration

(2) reduction of discharge

(3) drop in output and efficiency

(4) all of the above

118. For pumping viscous oil, the pump used is

(1) Centrifugal pump (2) Reciprocating pump

(3) Turbine pump (4) Screw pump

119. A pump which does not come in category of positive displacement pump is

(1) Reciprocating pump (2) Gear pump

(3) Vane pump (4) Centrifugal pump

120. The water turbine selected for head varying from 50 m to 150 m is
(1) Bulb turbine (2) Propeller turbine
(3) Pelton wheel (4) Francis turbine

121. Airy vessels are provided in reciprocating pump
(1) to store air discharged by pump
(2) to obtain continuous discharge from the pump
(3) to increase the pressure of water
(4) to safeguard the pump

122. Petroleum can be classified as
(1) a renewable form of energy source
(2) a non-renewable form of energy source
(3) a non-conventional form of energy source
(4) none of the above

123. Disadvantage of using solar energy for power production is
(1) energy available in daytime only
(2) initial cost is high
(3) requirement of large area for harnessing solar energy
(4) all of the above

124. Solar cells are made of
(1) Silica (2) Antimony
(3) Carbon (4) Steel

125. Which of the following devices can be used to harness solar energy ?
(1) Photo-voltaic cell (2) Wind mill
(3) Gas turbine (4) Steam turbine

126. When can we have windmill for power ?
(1) When high velocity wind (not cyclonic) for long duration of day is available
(2) Cyclonic wind is available
(3) Low velocity wind is constantly available
(4) Movement of air occurs

127. Which one of the following is correct statement ?
(1) Latent heat is the heat that does not follow first law of thermodynamics.
(2) Latent heat is the heat that is required to change the substance from solid to gaseous state
(3) Latent heat is the heat that can be detected.
(4) Latent heat is the heat required to change a state of substance from liquid to gaseous state.

128. In steam power plant, thermodynamic cycle used is
(1) Brayton (2) Rankine
(3) Carnot (4) Joule

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129. Match List-I correctly with List-II and select your answer using the code given below :

	List-I		List-II
(A)	Steam Engine	I.	Spark plug
(B)	Steam Turbine	II.	Eccentric
(C)	Otto cycle Engine	III.	Manhole
(D)	Boiler	IV.	Fixed and moving blades

	(A)	(B)	(C)	(D)
(1)	II	IV	I	III
(2)	III	II	I	IV
(3)	IV	III	II	I
(4)	I	III	IV	II

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130. The fuel mostly used in Steam Boilers is
(1) Peat
(2) Coking bituminous coal
(3) Non-coking bituminous coal
(4) Brown coal

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131. In a four stroke engine, we get one power stroke in
(1) 270° of crank rotation (2) 360° of crank rotation
(3) 540° of crank rotation (4) 720° of crank rotation

---

132. Morse test is carried out to determine the I.P. of a
(1) single cylinder petrol engine
(2) single cylinder diesel engine
(3) multi cylinder engine
(4) double acting steam engine

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133. The device for smoothing out the power impulses from the engine is called
(1) Fly wheel (2) Clutch
(3) Torque convertor (4) Differential

---

134. Which one of the statements is correct ?
(i) Petrol engine is a reciprocating engine
(ii) Petrol engine is a high speed engine
(iii) Petrol engine uses petrol as fuel
(iv) Petrol engine is an internal combustion engine
(1) All four are correct (2) Only (i) is correct
(3) Only (iv) is correct (4) All are wrong

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135. To develop high voltage for spark plug of petrol engine,
(1) distributor is installed (2) carburettor is installed
(3) battery is installed (4) ignition coil is installed

136. Standard firing order for four cylinder four stroke petrol engine is
(1) 1 - 4 - 3 - 2 (2) 1 - 3 - 4 - 2
(3) 1 - 3 - 2 - 4 (4) 1 - 2 - 3 - 4

137. In compression-ignition four stroke cycle engine, cam shaft runs at
(1) half the speed of crankshaft
(2) same the speed of crankshaft
(3) twice the speed of crankshaft
(4) any speed irrespective of crankshaft speed

138. The actual volume of fresh charge taken into four stroke-petrol engine is
(1) less than stroke volume
(2) equal to stroke volume
(3) equal to stroke volume + clearance volume
(4) does not depend upon stroke volume

139. A two stroke I.C. engine is identified by _____.
(1) the size of the engine (2) size of the fly wheel
(3) type of cooling system (4) absence of valves

140. Within a carburettor, the velocity of air is maximum at _____
(1) outlet
(2) inlet
(3) throat at venturi
(4) central point of total length

141. The diesel engine, is identified by the presence of _____
(1) air cleaner (2) radiator
(3) fuel injector (4) starter

142. In a heat engine, which of the following energy conservation occurs ?
(1) Work is converted into heat
(2) Heat energy is converted into electrical energy
(3) Heat energy is converted into work
(4) Electrical energy is converted into heat energy

143. What is thermal efficiency of a heat engine ?
(1) It is the ratio of brake power to indicated power
(2) It is the ratio of work output to heat supplied
(3) It is the ratio of heat rejected to heat supplied
(4) It is the ratio of work output to heat rejected

144. Compression ratio of a petrol engine is _____
(1) higher than that of diesel engine
(2) lower than that of diesel engine
(3) equal to that of diesel engine
(4) none of the above

145. In a condensing steam engine, _____
(1) the pressure in condenser is above atmospheric pressure
(2) the pressure is below atmospheric pressure
(3) the pressure is equal to atmospheric pressure
(4) the complete vacuum exists in condenser

146. With increase in compression ratio, the thermal efficiency of the Otto cycle
(1) decreases
(2) does not change
(3) cannot be predicted unless 'γ' (adiabatic index) is known
(4) increases

147. As the compression ratio increases, the volumetric efficiency of compressor
(1) decreases
(2) increases
(3) remains same
(4) becomes unpredictable

148. Rotary compressor can supply
(1) large volumes of air at low pressure
(2) small volumes of air at high pressure
(3) large volumes of air at high pressure
(4) small volumes of air at low pressure

149. Which one of the following is not a safety device on compressor ?
(1) Relief valve
(2) Over-pressure shut down
(3) Strainer
(4) Over-speed shut down

150. The axial flow compressor and centrifugal compressor represent
(1) positive and non-positive type of rotary compressors respectively.
(2) positive type compressors.
(3) non-positive and positive type of rotary compressors respectively.
(4) non-positive type of compressors.