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<b>R-11/R-13</b>
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**Code : 1GC42**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

**Probability and Statistics**

( Common to CE, ME & IT )

**Max. Marks: 70**

**Time: 03 Hours**

Answer any five questions  
All Questions carry equal marks (14 Marks each)

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1. a) Find the mean, median and mode for the following distribution.

x	1	2	3	4	5	6	7	8
y	4	9	6	25	22	18	7	3

b) Find the rank correlation for the following indices of supply and price of an article.

Supplyindex	124	100	105	112	102	93	99	115	123	104	99	113	121	103	101
Priceindex	80	100	102	91	100	111	109	100	89	104	111	102	98	111	123

2. a) State and Prove Baye’s theorem.

b) If the probability that a communication system will have high fidelity is 0.81 and the probability that it will have high fidelity and high selectivity is 0.18, what is probability that a system with high fidelity will also have high selectivity?

3. a) Check whether the following can serve as probability distributions:

(i)  $f(x) = \frac{x-2}{2}$  for  $x = 1, 2, 3, 4$

(ii)  $h(x) = \frac{x^2}{25}$  for  $x = 0, 1, 2, 3, 4$

b) Find the value of  $k$  and the distribution function  $F(x)$  given the probability density function of a random variable  $X$  as:

$$f(x) = \frac{k}{x^2 + 1}, \quad -\infty < x < \infty.$$

4. a) Prove that the mean and the variance of the Poisson distribution are equal.

b) Find the probabilities that a random variable having the standard normal distribution will take on a value

- (i) between 0.87 and 1.28 ;
- (ii) between -0.34 and 0.62 ;
- (iii) greater than 0.85;
- (iv) greater than -0.65.

5 A population consists of six numbers 4,8,12,16,20,24. Consider all samples of size two which can be drawn without replacement from this population. Find

- (a) Population mean
- (b) Population S.D
- (c) Mean of the sampling distribution of means
- (d) S.D of the sampling distribution of means.

6. a) Explain briefly the following
- (i) Point Estimation
  - (ii) Interval Estimation
- b) The average zinc concentration recovered from a sample of zinc measurements in 36 different locations is found to be 2.6 grams per millilitre. Find a 95% confidence intervals for the mean zinc concentration in the river. Assume that the population standard deviation is 0.3.
7. a) Explain the test procedure for  $Z$  – test concerning one mean when  $\sigma$  is known.
- b) A storekeeper wanted to buy a large quantity of bulbs from two brands A and B respectively. He bought 100 bulbs from each brand A and B and found by testing brand A had mean life time of 1120 hrs and the S.D of 75 hrs and brand B had mean life time 1062 hrs and S.D of 82 hrs. Examine whether the difference of means is significant. Use a 0.01 level of significance.
8. Four methods are under development for making discs of a super conducting material. Fifty discs are made by each method and they are checked for super conductivity when cooled with liquid.

	1 <sup>st</sup> Method	2 <sup>nd</sup> Method	3 <sup>rd</sup> Method	4 <sup>th</sup> Method
Super Conductors	31	42	22	25
Failures	19	8	28	25

Test the significant difference between the proportions of conductors at 0.05 level.

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**R-11 / R-13**

**Code: 1G542**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

**Thermal Engineering-I**  
( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) Compare the actual and fuel air cycles of a petrol engine.  
b) Briefly discuss pumping and rubbing friction losses.
2. a) Discuss the relative advantages and disadvantages of internal combustion and external combustion engine  
b) Explain the principle of Magneto ignition system. Enumerate its advantages and disadvantages.
3. Describe with suitable sketches the combustion phenomenon in S.I engines.
4. a) Define "Injection advance". How does it affect the combustion phenomena in CI engine?  
b) What is delay period in CI engine? What are the factors that affect delay period?
5. The following details were noted on a four-cylinder four-stroke engine:  
Diameter = 100 mm, Stroke = 120 mm, Speed of the engine  $N = 1600$  rpm, Fuel consumption = 0.2 kg/min, Calorific value of fuel 44000 KJ/kg. Difference in tension on either side of the brake pulley = 40 kg, brake circumference is 300 cm.  
If the mechanical efficiency is 80% calculate (i) Brake thermal efficiency. (ii) Indicated mean effective pressure. (iii) Brake specific fuel consumption.
6. The average indicator and information taken from a 25 x 35 cm, single cylinder, double acting reciprocating air compressor operating at 80 rpm is head end area = 11.1 cm<sup>2</sup>, crank end area = 12.9 cm<sup>2</sup>, length = 7.5 cm, spring scale = 2.5 bar per cm of deflection. Account for the 5 cm dia piston rod and find,
  - i. The mean effective pressure and the indicated power for each end
  - ii. The total indicated power.
7. a) A centrifugal compressor receives air at the rate of 1400 m<sup>3</sup> / min at 100 kPa and 35°C and delivers at 350 kPa. It has an isentropic efficiency of 82 %. Mechanical losses amount to 2.5 % of the shaft power. Determine the power required and exit air temperature.  
b) Define rotary compressor? How are rotary compressors classified?
8. Explain briefly an axial flow compressor with a neat sketch.

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**R-11 / R-13**

**Code: 1G543**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

**Fluid Mechanics & Hydraulic Machines**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. The diameter of shaft is 0.5 m and it rotates at 200 rpm. Calculate the horsepower lost in the oil for a sleeve length of 100 mm. The thickness of the oil film is 1.0 mm.
2. State and prove Bernoulli's equation. State the assumptions made during its derivation.
3. a) Explain the terms hydraulic gradient and total energy lines  
b) A venturi meter is to be fitted in pipe of 0.25 m diameter where the pressure head is 7.6 m of flowing liquid and the maximum flow is  $8.1\text{m}^3$  per minute. Find the least diameter of the throat to ensure that the pressure head does not become negative. Take coefficient of discharge through the venturi meter is 0.96.
4. A jet of water moving at 15 m/sec impinges on a symmetrical concave vane shaped to deflect the jet through  $140^\circ$ . If the vane is moving at 6 m/sec find the angle of the jet so there is no shock at inlet. Also determine the absolute velocity of exit in magnitude & direction and the work done per unit weight of water.
5. a) What do you understand by pumped storage type of power station? What are its merits & demerits?  
b) The catchment area at a proposed site for a hydropower plant is  $200\text{ Km}^2$  and possible head of water is 140 m. The average annual rainfall is 145 cm and the losses are 16%. How much power can be developed?
6. A Pelton wheel is required to develop 9000 kw at the shaft, when working under a head of 300 m. Assuming the values of coefficient of velocity, speed ratio and ratio of diameter of wheel to the diameter of jet as 0.98, 0.45 and 12 respectively. Determine:  
i) The number of jets, ii) The diameter of the wheel. iii) The discharge required. and, iv) The diameter of the jet. Take the speed of the wheel as 500 rpm and the overall efficiency as 85%.
7. Explain what you understand by governing of a hydraulic turbine with neat sketch
8. Explain the working of a single stage centrifugal pump with neat diagram and also comment on discharge and pressure for centrifugal pumps connected in parallel and series

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Code: 1G541

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

**Kinematics of Machinery**

( Mechanical Engineering)

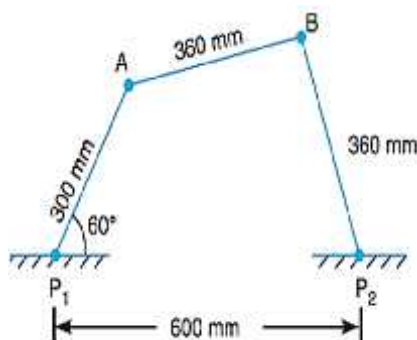
Max. Marks: 70

Time: 3 Hours

Answer any **five** questionsAll Questions carry equal marks (**14 Marks** each)

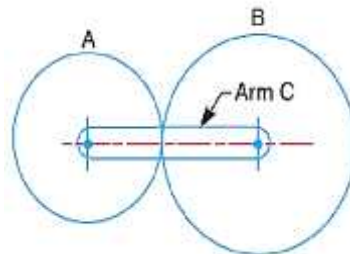
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1. a) Explain different types of constrained motions with the help of neat sketches. 7M  
b) Explain the term kinematic link. Give the classification of kinematic link 7M
2. a) Name the different mechanisms which are used for mathematically correct straight-line motion. 7M  
b) Give a neat sketch of the straight-line motion 'Hart mechanism.' Prove that it produces an exact straight-line motion 7M
3. In a slider crank mechanism, the length of crank OB and connecting rod AB are 125 mm and 500 mm respectively. The centre of gravity G of the connecting rod is 275 mm from the slider A. The crank speed is 600 r.p.m. clockwise. When the crank has turned  $45^\circ$  from the inner dead centre position, determine: a. velocity of the slider A, b. velocity of the point G, and c. angular velocity of the connecting rod AB. 14M
4. The dimensions and configuration of the four-bar mechanism, shown in Figure, are as follows:  $P_1A = 300$  mm;  $P_2B = 360$  mm;  $AB = 360$  mm, and  $P_1P_2 = 600$  mm. The angle  $AP_1P_2 = 60^\circ$ . The crank  $P_1A$  has an angular velocity of 10 rad/s and an angular acceleration of  $30 \text{ rad/s}^2$ , both clockwise. Determine the angular velocities and angular accelerations of  $P_2B$ , and AB and the velocity and acceleration of the joint B. 7M



5. A cam is to give the following motion to a knife-edged follower:
  1. Outstroke during  $60^\circ$  of cam rotation;
  2. Dwell for the next  $30^\circ$  of cam rotation;
  3. Return stroke during next  $60^\circ$  of cam rotation, and
  4. Dwell for the remaining  $210^\circ$  of cam rotation.
 The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft. 14M

6. a) Explain the terms: (i) Module, (ii) Pressure angle, and (iii) Addendum. 7M
- b) Derive an expression for the minimum number of teeth required on the pinion in order to avoid interference in involute gear teeth when it meshes with wheel. 7M
7. An open belt drive is required to transmit 9 kW of power from a motor pulley of diameter 120mm rotating at 900 rpm to another pulley to rotate at 300 rpm. The center distance is 1.8 meters. The belt is 12 mm thick and weighs 1000 kg/ m<sup>3</sup>. Coefficient of friction is 0.3. Allowable stress in the belt is not to exceed 2.1 MPa. Determine the width of the belt. 14M
8. a) What is a reverted gear train 4M
- b) In an epicyclic gear train as shown in figure with an arm C carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 r.p.m. in the anticlockwise direction about the centre of the gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed, makes 300 r.p.m. in the clockwise direction, what will be the speed of gear B? 10M



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<b>R-11 / R-13</b>
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**Code: 1G544**

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

**Manufacturing Technology**

( Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks** each)

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1. a) Explain the principles of a gating system with neat sketch? 7M  
b) What do you mean by pattern allowance? Explain different pattern allowances. 7M
2. a) Explain the investment casting process with neat sketch. 7M  
b) Give the relevance of the following with reference to a casting  
(i) Spruce (ii) Runner (iii) Ingate 7M
3. a) Describe the thermit welding process with applications? 7M  
b) Write about gas welding equipment. 7M
4. a) Explain the TIG welding process with neat sketch. 7M  
b) How is brazing different from soldering? Compare them with regard to methods adopted and their application? 7M
5. a) What is rolling? What are the various types of rolling mills? Explain them with neat sketch? 7M  
b) Explain:  
i) Re- crystallization ii) Grain growth in hot working 7M
6. a) Describe the wire drawing process with sketch? 7M  
b) Differentiate between compound and progressive dies 7M
7. a) Describe  
i) Forward extrusion ii) Backward extrusion 7M  
b) Classify the various types of forging process? How smith forging differs from that of drop forging. 7M
8. a) Explain the principle and working of electrical discharge machining (EDM). 7M  
b) What are the main applications of laser beam machining? Discuss its advantages and limitations. 7M

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